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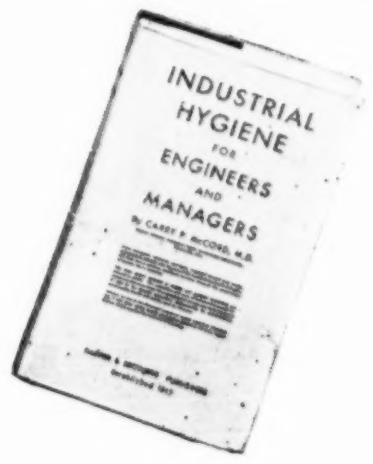

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The Law, the Science and the Economics of Industrial Health

Volume 2 **SEPTEMBER, 1933** **Number 3**

Occupations of Antiquity

—Relation to Health—

by

ROBERT T. LEGGE, M.D., F.A.C.S.
Professor of Hygiene
University of California
Berkeley, California

THE ROMANCE and history of industrial medicine and hygiene, starting from the beginning of time, afford an interesting field for the researcher. It is a very old adage that "there is nothing new under the sun." This is discouraging or intriguing according to one's point of view. Personally, while actively engaged in meeting the medical problems of today, I have always found it an exceedingly interesting and profitable recreation to study the similarities between our medical age and preceding eras.

"Occupational disease" and "traumatic surgery" are phrases which we are prone to think of as modern. But are they? Who were the real "pioneers" of industrial medicine?

These two questions started me out on a piece of historical research leading back to antiquity, and involving careful perusal of available data from the fields of science, history, art and exploration. The result reminds me of a jigsaw puzzle with maddeningly small pieces, many of which are missing. But, inasmuch as these findings, however fragmentary, represent the first authentic chapter in the history of industrial medicine, I believe it worthwhile to place them on record for each reader to speculate upon in his own particular way.

True, the ancient medicine man in the days of slave gangs was not beset with the ramifications of compensation laws and trade unions; but the building of pyramids must have involved quite as many accidents as modern skyscrapers; and glass-blowing, mining, and metallurgy have attendant ills, whatever the century.

The primitive physician not being acquainted with occupational diseases as such, being bound up with magic, folklore and superstition, did not contribute to our knowledge of the hazards that befell the craftsmen, toilers and slaves of his day. With the exception of the later Egyptian and early Greek epochs, there is a noticeable absence of comment by historians on this subject. But, considered in the light of today's knowledge of industrial hygiene and medicine, deductions on this interesting subject are far from being theoretical.

It is my aim to present to the reader a terse record of occupations and traumatic suregry from prehistoric time to the opening of the Roman conquest. It is possible to group some of the material under definite industries, and to trace their development in different countries through advancing eras. In other instances all one can do is to set down the facts in chronological order.

Implement and Armor Making

PROBABLY the earliest recorded trade is the making of implements, for defense and offense, and for obtaining and cooking food. In the search for truth by exploration and excavation, the anthropologist recognizes the difference between the crude hand-fashioned eoliths, roughly chipped artifacts and crudely shaped flint implements of the Chilean Age and those of the Neolithic Age, when men began to fashion their stone implements more painstakingly, and to polish them.

This fashioning of instruments, by its very crudeness, must have entailed a certain amount of trauma in the process, such as crushing injuries of the hands, cuts, fractures, and in extreme instances possibly loss of a finger.

Silhouettes of hands in red and black, as depicted

on walls of the cave at Gargas, Spain, of the Amignacian Age (late Paleolithic) show prevalence of finger amputations by primitive peoples.

All of these injuries demanded care which today we would classify as "traumatic surgery". Flying fragments of stone doubtless injured bystanders' eyes occasionally, and there was again need for first aid. We have no record of the ancient methods.

When the prehistoric cave dweller or tribal worker shaped his flint implements he ran the same risk of asthma, silicosis, and tuberculosis from inhalation of dust as the worker of today. The only difference lies in the amount inhaled.

In the first Sumerian dynasty, we find artisans producing a more finished type of weapon; socketed axes and adzes. Following the discovery of copper and bronze (3000 to 2500 B. C.) we find implements made from these materials.

In later eras, after the various metals had been discovered, armor-making became a skilled trade frequently mentioned in the bronze and iron ages, and in the archaic period of Greece. Demosthenes' father (458 B. C.) had a shield and bed factory, employing 52 slaves. The largest workshop in Athens was that of the father of the orator, Lysias (458-380), who employed 120 men in his armory.

Husbandry and Agriculture

IT WAS DURING the Neolithic Age that man domesticated animals, and began the agricultural industry by cultivating fruit trees and cereals. The herdsman was infected with carbuncle (anthrax), and sustained kicks and bites from his animals. The farmer was likewise subject to kicks and hornings with attendant lacerations.

The Construction Industry

RECORDS show that the building and construction industry was an important one many thousand years before Christ. With the advancement of domestic and tribal life, we find definite evidence of religious beliefs and funeral customs in the great tombs of the ancients, which were among the first known buildings. The earliest building material of which any still exists is the sun-dried bricks which date from predynastic times (3400 B. C.). Burnt bricks came into use at the time of the Roman occupation (30 B.C.).

Following the ancient tombs came the great prehistoric temples and pyramids. All of these required hundreds, even thousands of toilers, often working under hazards as great as those encountered in the building of our modern skyscrapers, and without safety devices.

Unfortunately, under the dynasty system, most of the work was done by slaves and members of the lower caste, of whom there was an over-supply and whose life was therefore valued at nothing. Records of first aid and accident surgery are notable for their absence. But would our annals of industrial surgery be so complete today if it were not for the pressure of compensation acts, trades unions, and an increasing humanitarianism on the part of society?

That there were many fractures in these ancient days, and that splints were used we can be certain, as they have been found in many mummies and are depicted on certain tombs.

Archaeologists' excavations show that, in the Assyro-Babylonian civilization, there were splendid drains, sewers, and stone privies; and that these wonderful people who were founders of astronomy, astrology and mathematics insisted on trench burial of their military dead, thus orginating a code of cult cleanliness which was later carried over and assimmilated by the Hebrews and Greeks. All of this required construction work almost modern in complexity and hazard.

Of Assyro-Babylonian surgery we know nothing. Theirs was a system of medicine in which the whole people was the physician. But it is not too speculative to assume that these keen, early minds who accomplished so much in advancing the beginnings of sanitation and public health did not rely entirely upon healing deities, but attempted to relieve traumatic injuries, allay pain, and control hemorrhage themselves. The methods remain a mystery.

It was in this cradle of civilization that a Sumerian epic was found, in which is embodied a mythical account of the beginning of medicine, written during the Isin dynasty (2100 B.C.) and relating the story of the creation of the healing deities.

The recent excavations in Mesopotamia definitely determined that the earliest graves of Ur (3500 B. C.) contain evidence of culture and a civilization that predates the Egyptians. The knowledge of building evidenced by the introduction of the arch in the roofing of royal tombs, and by the brick doorways, and the high level to which the Mesopotamians raised arts and crafts, have won the admiration of every archaeologist who has studied their industrial advancement. Coincident with these achievements there must have been a toll of industrial accidents.

The origin of Egyptian civilization is hidden in the darkness of antiquity. The 26 dynasties of kings that ruled the country from Menes the First (2700 B. C.) to conquests of Egypt by the Persians (525 B. C.) was a remarkable epoch in the world's history of civilization and progress in the arts of life. The oldest and largest buildings in the world of today—the great pyramids—were constructed during the fourth dynasty.

Already these ancient workers in stone understood the principles of elementary engineering, transportation, architecture and masonry. With the introduction of copper tools in Egypt during the III and IV dynasty (2980-2750 B. C.) came the phenomenal working of stone for building tombs.

It is not difficult to picture the many souls who perished, and who suffered in the cutting and placing of the stones in creating the Great Pyramid of Gizeh.

Through 12 centuries there was continual progress in Egyptian art and architecture, which culminated in the building, during the Grand Age, of the great palaces of Thebes, noted for the perfection of their architecture. During this period artisans such as sculptors, masons, fresco painters, potters and embalmers attained great skill. These people were also adepts in the finer kinds of mechanical art; goldsmiths, workers in precious stones, glass-blowers and ceramic makers. The wearing of fine linen stimulated them to attain perfection in weaving and dyeing.

History does not record the occupational diseases nor the physical injuries these ancient workers sustained. But it is safe to assume that the potters who glazed their wares were subject to lead poisoning, the masons to dust diseases and lime burns, the fresco painters to the effects of poisonous pigments, the glass-blowers to cataract and to emphysema of the lungs, and the embalmers to infections.

During the building of Solomon's temple, about 930 B.C., gang labor appeared in Israel and operative masonry was perfected—an outstanding achievement in Jewish industry.

The ancient temples of Greece should also be mentioned to make this survey of the construction industry in antiquity complete.

The Bronze Age, Metallurgy, and Mining

MOSES apparently names all the metals known to his day. Besides gold, silver, copper, iron and lead, he mentions "bedel" which commentators and dictionaries interpret as tin.

In the age of bronze, about 3000 B.C., stone implements were replaced by metal ones. This replacement apparently took place even earlier in Mesopotamia, where excavations show that the Sumerian artisans of 3500 B.C., possessed a technique in metallurgy which could result only from years of apprenticeship.

One may well imagine the transformation in industry which resulted from the introduction of bronze, and how thrilled the artisan of this period must have been when he worked for the first time with metal tools. Smelting was probably discovered accidentally, and a new trade was established in the casting of tools and implements of brass, an alloy of copper. Zinc became known in the late bronze age, 500 B.C.

Since smelting was done in the open there was not the danger from gases and arsenic fumes that one encounters in a closed factory; but certainly this ancient foundry man must have suffered from brass ague (chills and fever) consequent to the inhalation of zinc fumes, just as his brother does today.

Chalkos, the Greek word for copper, comes from the name of a locality, Chalkis, is S.E. Asia Minor, where, Pliny states, copper was first found, and where the Babylonians in the days of the third dynasty of Ur (2300 B.C.) obtained their supplies. The Egyptians began using copper tools for the fashioning of stone even earlier than this.

The men of Tyre established factories on the island of Cyprus, and great heaps of copper slag which testify to the mining activities of the Phoenician have been found there. In fact these evidences of the early Phoenician copper mines are visible to this day on the island. Indications show that the Romans up to the second century were obliged to abandon these operations on account of gas fumes and heat. Galen (130-201 A.D.) made a journey to one of these Cyprus caves and corroborates that he smelled the suffocating fumes and saw the workers naked, as the acid fumes destroyed their clothes.

The first copper coins made their appearance in Lydia about 700 B.C. These required die-makers and coppersmiths.

The use of bronze in Egypt is not credited until the period of the XVIII dynasty (1580 to 1350 B.C.) by which time the Pharoahs, through their domination of Syria, were in a position to obtain it from foreign sources. The copper deposits of Sinai, from which the Egyptians drew their supplies of copper, do not contain tin. It is likely that Cyprus yielded most of the copper found in Ancient Egypt.

The Phoenicians in the days of David and Solomon wrought the mines of Cornwall and Devonshire for tin, but kept the source secret. Wherever they went, they introduced trades, industry and commerce, and thus sowed the seeds of civilization. The Egyptians received from these daring navigators and skilled merchants the tin to produce bronze tools and useful domestic articles, possibly producing the first tin can.

Pliny refers to the use of tin for plating other metals as being common in ancient times, and says the articles so tinned could scarcely be distinguished from silver. He adds that the tinning process was so thin it did not increase the weight of the vessels.

According to recent discoveries, oxide of tin was used by the ancient Assyrians and Egyptians for enameling and glazing earthenware, an application hitherto considered quite a modern invention.

Mining for gold, silver and other metals is one of the oldest industries, dating from time immemorial.

Pliny describes an amalgamation process for extracting gold and silver from earth, almost identical with that practiced today. Agricola, in his Book VI, relates that there is a certain kind of Cadmia (arsenical cobalt) which eats away the feet and the hands of workmen and injures their lungs and eyes. The dangers of cobalt as a poisonous metal were known to Hiram, King of Tyre, who, skilled in mining, refused the 20 towns in the land of Cabul with which Solomon had presented him, because the veins contained cobalt.

The Iron Age was ushered into the North Mediterranean countries about 1000 B.C., when man learned to smelt ore. Doubtless he acquired many burns in the process. As a result of increasing knowledge of the use of this abundant metal, there have developed through the ages more occupations and greater progress in industry and culture than existed in all of previous time.

Sargon II in 722 B.C., armed the Assyrians with new weapons, and armorers, smithies, grinders and polishers sprang into existence. Forges are frequently mentioned by Homer. Iron is among the first metals named in the Scripture. Thus: "and Zellah she bare also Tubal Cain, an artificer in brass and iron." Moses refers to iron furnaces: "To the north of Judea was situated Chalybia, the inhabitants of which, it is said by the Greeks, have discovered the tempering of steel."

Petrie states that the oldest iron knives date back to 1350 B.C., and that by 1200 B.C., the people of Gerar were making heavy tools, including hoes and plough points. In Egypt the industrial use of iron appears to begin in the days of Rameses II (13th century B.C.). This early iron was probably of meteoric origin since the "iron age", as generally understood, did not appear until about 800 B.C., when the country was decadent.

The Glass Industry

GLASS, according to Pliny (*Hist. Nat.*, xxxvi 26) was accidentally discovered by Phoenicians near Carmel when firing sand with nitre. The Sidonians carried the glass art to a high degree and attained skill in the art of fusing, blowing and coloring it. The people of Egypt and Assyria at an early period of their existence were acquainted with glass blowing and cutting, and during the Grand Age became highly skilled in the art. After the expedition of Alexander we find the manufacture of glass important in Asia Minor, Phoenicia and Egypt.

In Homer's time (850 B.C.) the manufacture of food and clothing being still a domestic industry, the only kind of workshop was the forge, which required a special plant, necessary to the manufacture of a strong or delicate article of metal. "The divine blacksmith moves about his bellows and fires, naked and running with sweat." (Homer.)

The "Odyssey" describes the tempering of iron, the workers in gold, leather and ceramics. Asklepios, the Greek legendary god of medicine, appears about Homer's time (850 B.C.).

In Macedonia, where lead mines were worked and the ore smelted in the time of Phillip, the father of Alexander, large heaps of slag are still found so far above the level of the rivers of the country that the furnaces in which they were produced must have been fanned either by bellows worked by human labor, or by the force of the winds. Hippocrates was probably the first of the ancients to recognize lead as the causation of symptoms; he describes a severe attack of colic in a man who extracted metals.

Pigments and Cosmetics

THE EMPLOYMENT of cinnabar (mercury) as a pigment in painting, which was held in high esteem by the Egyptians, and the white lead that women used as a face powder in 400 B.C., must have affected the producers with colic, palsies and salivations. Likewise, since the vermilion which the women used in place of lipstick was made of mercury, the danger of mercurial poisoning arose in production.

Pliny, the Roman (23-79 A.D.) states that the workers preparing vermilion covered their faces with transparent bladder skin, that they might not inhale pernicious powder, thus recording an early attempt to prevent an occupational disease.

During the archaic period of Greece, colonization and trade set industry in motion. With the progress of technical methods specialization developed, and as as result a number of trades increased. At the beginning of the sixth century Athens was finding itself an industrial city. Ship-building, textiles, iron working and pottery gave her a commercial monopoly.

The fifth and fourth centuries B.C., in Greece were the Athenian period. Skilled artisans developed in various fields, and apprenticeship was demanded. "How long," says Plato, "the potter's son helps his father and watches him at work before he touches the wheel." Cleon inherited a tannery.

The sons of Cephalus, the maker of shields, succeeded the father.

Streets were set apart for certain industries. Textiles were beginning to be made outside the homes, and women were being employed as skilled artificers. Machines were few, so factories were small, the labor done by craftsmen. In a play of Aristophanes, a goldsmith and harness maker go to a house to mend a clasp and strap.

Tasks were not necessarily monotonous, as machine-rule over men, forcing them to repeat the same motion

over and over again was negligible. The largest workshop in Athens, that of the father of the orator, Lysias, (458-380) employed 120 men. The father of Sophocles owned a workshop of slave blacksmiths, while Isocrates' father had a workshop of slave musical instrument makers.

The long list of industries mentioned by historians after the expedition of Alexander shows how important industrial labor had become. The textile industries, metal working, shipbuilding, pottery, manufacture of glass, perfumes, parchment and paper acquired a very important place in Asia Minor, Phoenicia, Syria and Egypt. In some instances the raw material required was smeltings imported from great distances; and the manufactured goods, which far exceeded the needs of loacl consumption, fed an extensive trade.

The Hellenistic period saw the conquest of the East. It expanded the field already open to Greek trade, and was a period of great industrial prosperity. Trade unions flourished, and specialists thrived in every field of occupation. Inventions were numerous, but the absence of machinery prevented the workshop from becoming a big factory, labor from concentrating in great numbers, and wholesale production from killing the work of the family.

As Greek industry progressed and profited from the experiences of the ages, invention and culture, likewise trade, transportation and skill among artisans attained a high degree of excellence. The interchange of ideas as a result of war and commerce, the advancement of Hippocratic medicine, the influence of the Greek Alexandria School to the time of the Elder Pliny, the historian, stimulated inquiry into the care of diseases and injuries resulting from the greatest occupations of the day, war and trade.

Primitive Surgery and Industrial Hygiene

HAVING TRACED the development of industry through the civilizations of antiquity, one would like to parallel this with pertinent comment on the traumatic surgery and industrial hygiene of the same eras. Unfortunately source material on these interesting subjects is sadly lacking, and only disjointed and incomplete comment is possible.

The only occupational disease which I was able to find mentioned, as such, was "knife-grinder's disease" in the Ebers Papyrus, and it is not clear just what this is. "When thou examinest a person who is suffering in his abdomen and findest something in his backbone, like the trouble in 'knife-grinder's disease', then thou sayest: 'This is the uxedu that has spread to his back. He is ill; I will make him the back remedy.' "

Pliny, the Roman (23-79 A.D.), seems to be the first to make any record of preventive medicine in industry. In his book *Naturalis Historia*, he remarks upon the effect of dust on workers, and evidently provided the first respirator for its prevention. He also mentions the precautions against poisoning taken by the vermilion manufacturers.

The birth of primitive surgery is surely as prehistoric as the origin of the human race. Man's combative instincts awakened the necessity to care for his wounds and allay pain. The staunching of blood, the extractions of stone imbedded in the flesh, and the application of splints to damaged bones was the dawn of surgery.

It is evident that primitive surgery advanced as the prehistoric medicine man, priest or physician adjusted himself to the changing experiences he had to encounter as life progressed through the ancient Assyrian, Egyptian, and Jewish civilizations, to the Golden Age of Greece when Hippocrates, the Father of Medicine, lived and practiced.

The followers of the healing deity of Isis were rudimentary surgeons whose knowledge of anatomy was small; yet they were skilful in the removal of tumors with their bronze knives, well practiced in the splinting of fractures by means of palm fiber bandages, and in the art of embalming they astonished the world.

The amputations shown in ancient silhouettes apparently go back even farther than trephining, which was used for the relief of mental disturbances during the Neolithic Period (6000 B.C.) when the cautery was also used extensively. Prehistoric trephining was practiced by the ancient Yangos of Peru.

At Saquaral near Memphis, dated 2500 B.C., there is depicted on a tomb one of the earliest pictures of surgical operations.

Imhotep is recognized as the tutelary deity of early Egyptian medicine (held supreme for 3000 years until the fourth century A.D.). He first appears on the stage of history as vizier-physician of King Zoser, a Pharoah of the III dynasty (2900 B.C.).

In the Smith Papyrus (1600 B.C.) are descriptions of head injuries and cranial fractures, dislocations of the cervical vertebrae, crushing injuries of the neck and the resulting brachial and crural palsies. These injuries can readily be attributed, at least in part, to building trades and stone quarrying.

The Papyrus clearly shows how the Egyptian physicians of this period had advanced in diagnosis and treatment. The application of splints in the reduction of fractures, and the skilful operation of trephining, already mentioned, was a development of these early practitioners. Traumatic wounds were dressed with oil, wine and balsams by these ancient peoples, who unknowingly practiced antisepsis.

One hundred years later the Ebers Papyrus was written. This beautifully illuminated document was

found in a tomb at Thebes. It is presumably one of the Hermetic Books. There is abundant evidence on philological and other grounds that it was copied from other books extending backward over many centuries.

This ancient book is one on diagnosis and treatment. The following are a few excerpts from its fascinating record of ancient medicine:—

"In minor surgery, to prevent wounds, a frog warmed in oil and rubbed on the body is suggested."

"For a black eye raw meat is applied." This has a rather up-to-date touch.

With some tumors the surgeon is directed to use cautery; for others, the knife. In the latter instance he is cautioned to beware of the vessels as he cuts. Hemorrhage is to be checked with cautery if the knife is used first. "When thou meetest a pustular tumor, bore through it with a knife."

Excrements, disgusting secretions and animal tissues were used extensively as therapeutic agents. But the use of opium, squills, wormwood, aloes, castor oil, and turpentine of their pharmacopea are all included to this day in our own materia medica. One must believe that they were acquainted with the pain-relieving effects of opium that has come down through the ages to our present day as the foremost drug.

The Hebrews, by contact with the marvelous Assyrian and Egyptian civilization, were taught the operation of circumcision which was part of the cleanliness cult of that era,* and not a religious custom originating with the Jews as is so commonly believed today. The operation is pictured on the Sakkarah pyramid (3000-4000 B.C.). The Hebrews also learned from the Egyptians how to bandage fracture cases. In the Holy Bible the only references to surgery are to circumcision and to the use of a bandage for fracture.

The Hebrews, however, must be given credit for the earliest step in industrial hygiene; the setting aside of a Sabbath Day to give the tired work-a-day humanity "a sort of permanent splint on which to rest" (Garrison). Indeed the Hebrews were preeminent in the creation of public hygiene. Moses, the Israelite and founder of the Hebrew nation, was a hygienist whose influence extended throughout the world,—the first maker of sanitary laws. He introduced compulsory rest, one day in seven, and promulgated detailed instructions concerning camp sanitation, diet and sex life which earned for him the everlasting honor of being the Father of Preventive Medicine.

Greek medicine first assumed a scientific aspect with Ionian and Italo-Greek philosophers, six centuries B.C. These men secured much from the earlier Minoans. War surgery as described in Homer's "Iliad" consists largely of treatment of wounds and extraction of arrows. The Ionian word for physician meant originally "an extractor of arrow points".

Hippocrates (460-377), the father of medicine lived in the fifth century, the age of Pericles. This great Greek physician gave us several books. In one, on epidemics, anthrax is mentioned. His work on fractures is the earliest classic. His treatment of wounds by first and second intention, and the use of clean water and wine sound like a 20th century practice. His aphorisms have been the by-words of medical students through the ages. Some of his proverbs relate to industry, as for instance "Work is necessary to health." "Never work when hungry."

This remarkable genius, who perscribed the oath that binds men of medicine to this day as an unselfish profession, observed that "diggers for metals were affected by fumes, breathed with difficulty, and had a wan complexion." He was probably the first of the ancients to recognize lead as the cause of symptoms, for he describes a severe attack of colic in a man who extracted metals.

Nicander, a Greek poet and physician, praised by Cicero and esteemed by Pliny, was born at Clavos near Colophon in the second century before Christ. Two of his poems have been preserved. The longer, "Therica," describes the nature of venomous animals and their bites; the other, "Alexi-pharmaca," treats of poisons and their antidotes. Both of his poems were translated into Latin and published in 1532 by E. Cordus, who gives a vivid picture of lead poisoning, with its colic, paralysis and ocular disturbances.

Conclusion

ALTHOUGH we are prone to think of industrial medicine as beginning with the invention of the steam engine, a really scientific approach to the subject from the historical point of view carries us back to antiquity. In this preliminary chapter* I have attempted to indicate what relationship may have existed between primitive medicine and industry as the evolution of man progressed from the beginning of time to the dawn of the Christian era.

The record of the industries of ancient epochs is much more complete than that of industrial medicine, probably because so much of the work was done by slaves and members of the lower caste whose lives were valueless.

Nevertheless, reasoning by inductive and deductive methods from the known trades of ancient epochs in correlation with 20th century practice, it is possible to construct a vivid picture of occupational injuries and diseases among the ancients. Occasional records indicate that the worker realized the hazards he en-

* Herodotus, a Greek who went into Egypt, writes: "They practice circumcision for the sake of cleanliness."

* Succeeding chapters will carry the history of industrial medicine through successive eras, down to the 20th century.

countered, but could not explain by reasoning what the modern industrial hygienist is able to solve today by preventive medicine and surgery.

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Not a Problem of Cost

IN DISCUSSING the matter of medical costs for the general population, a great deal of comparative material has been presented, showing the differences between the present system of medical practice based on a fee, as related to several different schemes of health insurance. The following comment, therefore, is worthy of consideration:

"To believe that a change from this method of payment for services will bring efficient medical service to every member of this country's huge population is to ignore such factors as a per capita income of only $700 in prosperous 1929; a spread of123,000,000 human beings over 3,000,000 square miles, with a concentration in some areas of 20,000 to the square mile and in others of only one to the square mile; a not insignificant group of illiterates; a fickle climate and temperature ranges from 45° below zero to 119° above; but above all, the millions of people who refuse to accept definitely proved scientific facts such as smallpox vaccination, diptheria immunization and the host of other scientific health aids, and who waste some $485,000,000 annually on cults and patent medicines because of their ignorance or superintelligence.

Lowering and standardizing medical costs may induce a few timid souls to investigate what medical science has to offer, but the great majority would go on glibly spending their money on cosmetics, chewing-gum, cigarettes and recreation, and raising the hue and cry of being robbed and pillaged when stricken with illness.

"If cost were the all important factor, why is it that in spite of the large volume of free work done by the hospitals, health departments, and individual practitioners, and in spite of the sliding scale of charges, it appears that each year nearly one-half of the individuals in the lowest income group receive no professional medical or dental attention of any kind. curative or preventive? Why is that people fail to take advantage of low-cost readily available preventive medical procedures, the benefits of which are known and proved?

"The costs of medical services will be standardized and lowered when the factors which make up those costs become changed from intangibles to tangibles; that is, when the practice of medicine becomes an exact science and the elements of individual variations in human beings both in health and in disease have all been standardized and catalogued. As long as medicine continues as both an art and a science, a change from the fee-for-service plan must result in a let down in interest and a shading of responsibility on the part of doctors, to the detriment of those whom they are called upon to treat.

"We have had five years devoted to investigation and emphasis on *cost* of medical care. Shouldn't we have fully as much time and effort expended on acquainting the American public with what medicine has to offer and on creating an active demand for its services? Isn't is possible that through this method of approach the problem of costs might be more readily solved?"—Editorial, *The Bulletin of the Wayne County Medical Society.*

Fatigue

FATIGUE is ordinarily described in two forms, physiologic fatigue and pathologic fatigue. The former results from the expenditure of muscular and mental energy in doing the task which is worth while and from which one receives a result which is satisfactory; the latter is produced by disease, worry, dissatisfaction or discontentment with one's life or work and the outlook.

It is important that we should learn to recognize as early as possible the evidences of physical breakdown resulting from any of these or other forms of overstrain; most of these signs are simply those of continued pathologic fatigue: (1) if you are too tired to enjoy your dinner at the end of the day; (2) if you cannot relax after leaving the job; (3) if you cannot sleep at night; (4) if you despise your work and dread to begin in the morning; (5) if you are getting cross and impatient; (6) if you are jumpy and crack up easily when the unexpected happens; (7) if you are losing weight without apparent cause; (8) if you are losing your snap and pep; (9) if you are worrying about things that you cannot help; and (10) if you cannot laugh,—*it is time to make a change.*—Dr Thurman B. Rice, in *Clinical Medicine and Surgery.*

"Compensable Back"

—Its Routine Physical Examination—

by

JOHN D. ELLIS, S.B., M.D., F.A.C.S.

IN THE Robert Jones Lecture, delivered at the Hospital for Joint Diseases, New York City, October 27, 1932, that Nestor of orthopedic surgery, Joel E. Goldthwait, made the timely observation that "the skill required for operative work (orthopedic) is much less than that required for diagnosis in the many non-operative cases with the planning of the appropriate treatment. Back cases, as usually seen, are uninteresting, because the average surgeon does not understand them. Once understood, they become interesting, and intelligently treated, cease to be the burden of the clinic." Now, if this be true in the orthopedic specialty, it is no less true in the specialty of the surgery of injury. The "compensable back" (by which term I chose to designate the minor sprains, strains and aggravated arthritides without x-ray findings of actual fracture or notable degrees of spondylolisthesis) has become the *bete noire* of both the compensation board arbitrator and the surgeon called upon to determine the nature of the worker's disability, the time of its actual termination, or its proper treatment.

The development of more adequate roentgenograms, especially clear and diagnostic laterals, has been, in some measure, a deterrent in actual diagnosis, since even competent radiograms cannot visualize or distinguish a minor joint injury, whether arthritic, joint cartilage or capsular, from the accompanying protective reaction of the overlying muscles and ligaments which help to immobilize the tender joint, which makes diagnosis difficult. Likewise, myositis and muscle sprains, and strains without underlying joint lesions, cannot be visualized or distinguished by x-ray.

Furthermore, working men of middle and old age are prone to display in the x-ray varying degrees of calcium salt deposits about joint edges, ligament, tendon and muscle attachments, but give little information as to the chronicity or acuity of such deposits or the degree of aggravation due to trauma.

The amount of loss of function in the injured back can no more be assayed by x-ray examination than can this type of examination be relied upon to diagnose the commonest type of traumatic knee disability, injury of the internal semilunar cartilage; or the frequent cause of intractably painful shoulder which results from rupture of the supraspinatus tendon.

The actual diagnosis in the "compensable back" must, then, be arrived at by (1) history of the occurrence of the trauma; (2) general examination; and (3) specific examination of the back itself. The present paper is limited to the criteria for arriving at a diagnosis which may be obtained by a routine and systematic examination of the back itself. The importance of a careful diagnosis is significant because upon the diagnosis depend the decisions:

1. As to whether any actual physical disability exists with objective findings which may, if necessary, be made clear to a compensation board of laymen.

2. As to what the nature of the disability actually is, e.g., a lumbosacral, sacroiliac or intervertebral strain; a non-traumatic arthritis; merely a muscle or ligamentous injury; or a myositis, etc.

THE SECOND consideration is important, because upon the actual diagnosis depends the type of management which the case deserves.

I cannot condemn too strongly the unfortunate habit of routine daily application of lights or heat to the injured back with no further attempt at diagnosis or therapeusis and calling this "physiotherapy."

The examination of the "compensable back" is made tremendously more difficult by the fact that, with the exception of the objective evidence elicited by expert manipulation (expert passive motion for diagnostic purposes), the physical signs that we find are those produced by spasm, contraction and rigidity of the muscles moving the joints, rather than signs produced by the painful joints themselves. But it is these problems of differentiation that we must attack.

Because of the limitation of time, my routine examination will be limited practically to the lumbar region.

When the lumbar muscles—in particular, the erector spinae group, which is one large muscle belly on either side comprised by the spinalis lumborum, longissiumus dorsi, and iliocostalis lumborum, named in order as one travels out from the midline—are examined manually, the three components can rarely be disinguished. In one chronic arthritis, involving most of the spine, I was sure I could palpate separately the stringy, fibrous and contracted longissimus. Rarely, in these patients, a contracted or spastic, shelf-like, lateral border of the quadratus lumborum can be distinguished. The short muscles running vertically between the transverse processes and the obliquely situated rotators cannot be identified.

The criteria which one expects to discover from examination of the loin muscles are those which correspond to the changes of the muscle system moving any joint, which characterise changes in the joint or its locomotor apparatus, whether it be spine, shoulder, hip, or other articulation.

There are the evidences of:

1. Acuity,
   - (a) Spasm of erector spinae muscles causing lateral deviation, lordosis, or immobility at one point.
   - (b) Tenderness of a definitive muscle group.
   - (c) Increased muscle consistency, due to products of extravation and infiltration.
   - (d) Defense reaction (like Hartman's defense reaction in the abdominal wall).
2. Chronicity,
   - (a) Contracture without spasm.
   - (b) Tenderness, not great or local; and may be absent.
   - (c) Muscle wasting.
   - (d) A definite and limited range of passive motion before actual pain begins.
   - (e) Signs of adhesions of old arthritic joints on,
     - (1) Jarring of spine with heel of hand, or
     - (2) Percussion of head.
3. Later chronicity,
   - (a) Contracture without spasm.
   - (b) Tenderness, not great or local; and may be absent.
   - (c) Muscle wasting.
   - (d) A definite and limited range of passive motion before actual pain begins.
   - (e) Signs of adhesion of old arthritic joints on,
     - (1) Jarring of spine with heel of hand, or
     - (2) Percussion of head.

Technic of Examination

THE AUTHOR is indebted for much of the rationale of this examination to the inspiration received from Dr. James Mennell, whom he saw perform many similar examinations in St. Thomas Hospital, London, in 1929. This routine is not offered as being superior to any other, but merely as being immensely superior to no routine method at all. I have examined many backs, as a consultant in injury cases, in patients who had been treated for weeks or months with no examination except cursory palpation, instruction "to bend forward," and x-ray study. The patient is stripped and walks about the room. The shoe heels are examined to ascertain whether there is more wearing of one than the other; tendency to walk on the ball of one foot, to keep one knee slightly flexed in walking, or to hold one side of the pelvis higher is noted.

GENERAL EXAMINATION IN SITTING POSITION. A stool is used high enough to allow the feet to rest on the floor, with the knees in right angle flexion and without a back. By inspection, it is noted whether the patient bears weight in equal amount on the two ischial tuberosities. If more weight is borne on one than the other, an investigation by trial postures must be made to ascertain whether this is deliberate, habitual or accidental. If the choice is

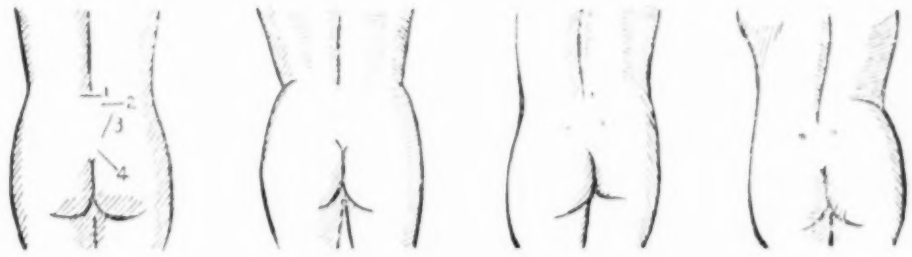

Fig. 1. (a) Lines represent areas of tenderness, 1—lumbosacral; 2—Iliolumbar ligament and articulated tranverse process of the fifth; 3—Sacroiliac articulation; and 4—sacrospinous ligament. (b) Spasm of both erector spinae groups with lordosis. (c) Spasm of left erector spinae with lateral deviation of entire lumbar spine (not confined to lumbosacral region). (d) Scoliosis, rotary, nontraumatic.

found to be deliberate, probably the sacroiliac or lumbosacral region on the side that is being spared is tender. Inspection is now made, noting,

1. Scoliosis, as to whether lateral, without compensatory curve in dorsal region and, therefore, more likely acute and protective, or rotatory, and with compensatory curves, probably little likely to be the result of injured or inflamed joints, muscles or ligaments, or post traumatic.

2. Erector spinae muscles, their relative prominence or state of contraction on the two sides. I have never been able to find a contra-lateral scoliosis

Fig. 2. Position and grip of the examiner for passive rotation to left in erect sitting position. The patient's locked arms fix the shoulder girdle on the chest. Passive rotation in sitting position must also be tried with back in hyperextension and in flexion. (This and following figures adapted from Mennell).

opposite in direction to the side of the inflammatory or traumatic lesion, such as Putti and others describe, nor an alternating scoliosis in post traumatic conditions.

3. The degree of loss of the normal lordosis as compared with that seen on standing—that is, whether the lumbar region flattens out completely on sitting down or retains most of the standing degree or lordosis because of spastic or fibrous erector spinae muscles.

4. The relative height of the posterior iliac spines, not only to each other, but each to its anterior superior fellow. By this finding of unilateral elevation of the posterior spine, a twist in one side of the pelvis on the sacroiliac joint—in my experience always an anomaly, but possibly, as Mennell finds, rarely traumatic—can be diagnosed before the radiogram is taken. The sacral hair and dimple of spina bifida occulta may be observed if present.

On palpation, a spasm, permanent increased tone, or defense reaction in lumbar muscles may be discovered, but palpation yields more definite findings in the prone position. Localized points of tenderness must be marked to see how they correspond to tender points in the prone position. The head and spine must be percussed, complaints of definite localized pressure pain being noted.

ACTIVE AND PASSIVE Movements in the Sitting Position. The patient is asked to bend forward. The normal spine should then show an approximately perfect curve. In men past middle age varying degrees of loss of flexion, of course, exist in the middorsal to lower cervical region. Local deviation to right or left, or tendency to bend the whole spine a little sidewise in flexion, is noted. The latter, of course, corroborates lateral scoliosis due to unilateral contracted or spastic erector spinae groups. The actual degree of flexion forward of the whole spine is less important than local or lateral discrepancies of mobility. The change in rhythm of the spine in resuming the upright position often more definitely reveals

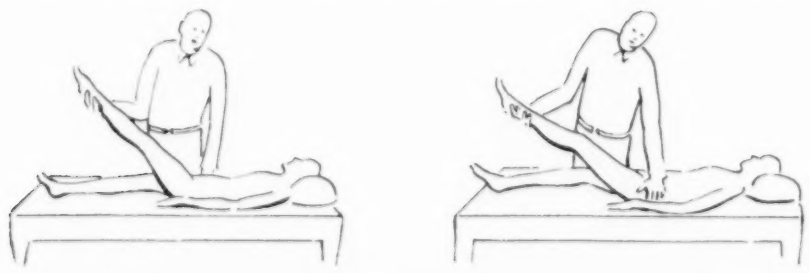

Fig. 3. To represent examination for strain of sacroiliac joint. Flexion of thigh to point shown in (a) is taken up by the hip joint. Further motion puts posterior rotary torsion on left sacroiliac. Anchoring pelvis to table as in (b) allows further painless flexion of thigh than in maneuver (a) without pain but if operator's left hand is suddenly removed after a further flexion, pain instantly appears in a left sacroiliac strain, particularly in posterior rotary strain.

pathology than flexion. There may be a lagging of one section, or a resumption of upright position by coming up at first slightly sidewise. One part—often the lumbosacral—may show no motion until complete extension has occurred in the rest of the spine, and then quite suddenly jump into extension. This is strongly suggestive of lumbosacral trouble. Finally, uprightness may be attained by a wriggling, snakelike motion, practically characteristic of intervertebral arthritis.

Lateral motion and voluntary rotation should next be performed and noted. Passive rotation, however, produces more reliable data, and passive lateral motion in the supine position is more reliable than in the sitting, as the examiner has, in the former, a better control of the patient's torso.

The examiner must rotate the torso on the sitting hips in three positions—hyperextension, erect position and flexion. If rotation elicits more expression of

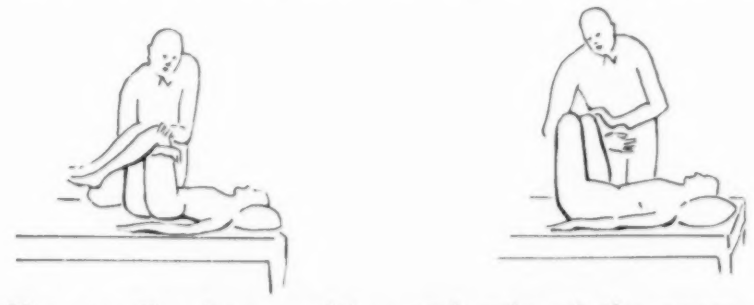

Fig. 4. To show position and grip of the examiner in testing lateral motion in lumbar spine. A wider angle of painless motion is usually obtained than in sitting position, since weight-bearing on painful or tender articulation is eliminated and spasm which is greater in sitting position, because in the supine position muscle tonus necessary to maintain erect posture is absent. Motion can be confined to lumbosacral junction when desired.

pain in one side of the lower lumbar region, there may be a lumbosacral strain, an articulated fifth transverse process, or a unilateral sacralization of the fifth. Whether these two latter conditions are likely actually to be more sensitive than the normally arranged fifth is subjudice to my mind. The careful work of Bertolotti and the Italian school of orthopedics in general indicates that an especially painful syndrome results on the sacralized side after slight injury.

There is often little impediment to rotation in lumbosacral strain if the condition be unilateral; however, rotation toward the side of the sprain can be passively performed to a greater degree than away from it, which latter manipulation finally reaches a point where the contracted lumbar muscles are put on a stretch and hence painful. It should be remembered that comparatively little rotation actually occurs in the normal lumbar spine, and this takes place between the fifth lumbar and the sacrum. Hence, passive rotation tests are the important criteria for painful motion in these joints particularly.

The amount of freedom of motion between the fifth and the sacrum depends to a large extent upon the direction of the articulations at this level. If these are in the coronal or frontal plane, lateral and rotary motions are much freer, than if, on one side or both, they are in the sagittal plane when both rotation and lateral bending are much restricted. Putti estimated that more than 20% are sagitally directed, an anomaly responsible for a fair degree of stiffness here without injury or disease at this level.

X-ray checks one's suspicion of this anomalous arrangement.

In sacroiliac conditions, the patient is more sensitive to twisting of the trunk on the pelvis while sitting than while standing, because while standing, if the sacroiliacs are sensitive, the rotation of the body is unavoidably taken up by the hip joints. The actual range of painless passive motion may vary if performed with the patient leaning forward, erect or leaning backward. If it is found that the range of painless movement is greater when the trunk is flexed, the diagnosis of an abnormally long transverse process impinging against an iliac wing (which may later be found in the x-ray) is strongly suggested.

EXAMINATION IN STANDING POSITION. In this position every point observed in the sitting position must be checked and compared. Inspection of the degree of lordosis is first made. The normal degree of "hollowness" of the lumbar region varies notably with body type, pendulous abdomen, flat chest and general posture which cannot be detailed here. Both unusually flat back and the pronounced "sway back" may be regarded as potential causes of backache, since both represent abnormal adjustments of muscle balance, making the maintenance of the erect position more easily disturbed than in a normally balanced back. An accentuated degree of lordosis limited to the upper lumbar region is frequently seen in the arthritic backs of short, stout, flat-backed individuals. Lateral deviation should be compared with the degree of lateral scoliosis in sitting, the length of the two legs being measured if notable discrepancy exists in this deviation. The rhythm of the back in flexion and return is not found so notably changed after joint injuries as in the sitting position. Most of

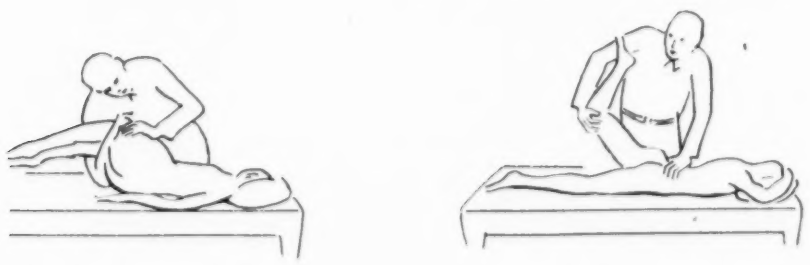

Fig. 5. Intended to show passive rotation maneuver in the supine position. The range may be more restricted than that possible in sitting position but can be more definitely confined to lumbosacral region. (b) Method of confining extension of thigh to hip joint; backward rotary torsion can be suddenly produced in left sacroiliac by suddenly releasing the examiner's left hand.

the flexion may be performed by the hips with the back held more nearly motionless than during the same movements while sitting. Active hyperextension gives a more notable difference in motion in sacroiliac than in lumbosacral conditions. In the former the movement can be seen to be performed in the lower spine, while in the latter, where this movement is from its inception painful, hyperextension is accompanied by movement at the hip joints.

EXAMINATION IN SUPINE POSITION. This is principally conducted by passive motion and the findings are of the greatest value in the diagnosis and allocation of lumbar and low-back pain.

It is important, first, to notice how the patient climbs upon the examining table. The examiner has an opportunity of observing the foot selected for the first step up, and the movement or lag in the movement which travels up the joints of the back in ascending. The patient with an involved hip or sacroiliac joint will never voluntarily use the leg on the affected side to step up onto the stool in mounting the table. This is true also if the ligaments between the tuberosity or spine of the ischium and the coccyx or sacrum are sore on one side only. The patient with low lumbar intervertebral soreness or lumbosacral soreness will often raise the leg on the painful side with the knee flexed and may raise this leg with the aid of his hands. General lumbar involvement with bilateral spasm of lumbar muscles may cause the patient to lie face downward on the couch and then roll over, avoiding the necessity of flexing the lumbar spine.

The natural position on lying supine must be noted. If the lumbar muscles are actually in spasm, almost the same degree of lordosis will persist as found on standing. If one side is spastic, the iliac crest can be seen to be notably higher. If this condition is due to acute muscle spasm and not to chronic fibrosis, the affected side of the pelvis can generally be brought down to the symmetrical position by a continued gentle traction on the thigh, but will promptly recur when the pull is released. With sacroiliac pain the patient may keep one knee and hip slightly flexed. If a unilateral lumbar muscle spasm is pronounced, the patient may prefer to lie or insist upon lying on the sound side and not supine, or if both sides are spastic, as in general soreness of the lumbar vertebral joints, he may refuse to assume the supine position at all.

Passive motions should begin by the elevation of both thighs with the knees extended. The degree of motion necessary to elicit pain is almost pathognomic of the level of the spine at which the soreness exists. The first 45 degrees of flexion can be taken up by the hip joints; thereafter the pull of the hamstrings puts a torsion strain on the sacroiliacs. At approximately 90 degrees flexion, the torsion is transmitted to the lumbosacral level, and motion further than this flexes the intervertebral joints of the lumbar spine progressively at higher levels as the motion is continued.

An interesting test is the flexion of both thighs with the pelvis held firmly fixed on the table by an assistant, confining all torsion stress to the sacroiliacs until the arc of motion which involves the lumbosacral region is reached, then suddenly releasing the fixed pelvis.

The flexion is suddenly transmitted to the junction of the fifth and sacrum, and if soreness is localized there, a sharp expression of pain is elicited. On raising the legs separately, both sacroiliac and lumbosacral pains are elicited at a smaller arc of motion than when both are raised.

Special tests of importance are:

1. Forcible compression and separation of the iliac crests, painful response to one or both of which is a distinctive indication of sacroiliac sprain, while these maneuvers have no effect upon the lumbosacral articulation.

2. Gaenslen's sacroiliac sign which puts forward torsion on a suspected sacroiliac by flexing the thigh of the suspected side, then hyperextending the thigh of the sound side. Pain appears in the suspected side.

Lateral motions of pelvis on spine can be adequately performed if the examiner passes his forearm under the flexed knees and swings the pelvis to either side. This motion can be thought of as "opening up" or pressing together the lumbar articulations as the right or left swing occurs. Unless sacroiliac strain is excessively acute, the stress exerted on this joint is negligible and the level in the lumbar spine which is painful can readily be determined. It is easy to produce a palpable or audible "snapping" which can often be definitely located in the affected joint or joints and indicates, to my mind, evidence of a low-grade local arthritis. This maneuver may temporarily relieve painful lumbar joints and relax protective muscle spasm so that the examined patient feels he has received a beneficial treatment or, in the terms of the chiropractic, an "adjustment." Rotation can also be studied by a similar manipulation and its actual restriction as well as its limits of painless motion recorded to compare later with the findings on manipulation in the sitting position. A greater range of painless motion can be elicited in the supine position, both on rotation and side flexion, than in the sitting position, because the latter position increases the muscle spasm and adds weight bearing to the painful motions of the affected joints, and "antigravity tonus" to spastic muscles.

Examination in the side-lying position is merely confirmatory to previous findings and adds only one advantage, which is that of making possible anterior rotatory torsion applied to a questionable sacroiliac joint by hyperextension of the thigh.

EXAMINATION IN THE PRONE POSITION. Again anterior rotatory torsion can be applied to the sacroiliac joint, and by holding the pelvis fixed on the table, these motions can be excluded from the lumbosacral and interlumbar joints. The prone position is the ideal position for palpation of the lumbar muscle bellies, and their attachments to the sacrum and pelvis. The quadratus edge must also be palpated for spasticity. Tender points found in the sitting position can be verified and false statements as to their location checked. Local or general muscle spasm and Hartman's defense can be studied. The sacrum and iliac crests must be carefully and systematically palpated for the telltale nodes and sensitive areas of "myofascitis" or chronic myostitis. The sciatic nerve, iliolumbar and sacrospinous ligaments, lumbosacral and sacroiliac joints can be palpated directly for tender pressure points.

EXAGGERATION AND MALINGERING. The data obtained from the foregoing examination furnish comprehensive evidence when associated and tabulated for objective proof of discrepancy between the symptoms complained of and the actual anatomic and clinical findings, to prove or disprove the patient's claim. A careful mechanical and clinical analysis of lumbar and low-back pain findings will sufficiently unmask unjustified complaints and aid in the detection of malingerers without special tests for malingering. If necessary, one can point out on the witness stand the discrepancy between subjective symptoms and actual demonstrable loss of range of motion, failure of definitive tendencies and pain on motion to correspond with the alleged disability. Certain objective features of low-back strain of various types cannot be feigned. Voluntary rigidity from muscle contraction is, for instance, always bilateral. No patient can remember to keep the proper muscles contracted and complain of motion at the proper point in its excursion, which one finds in veritable injury or arthritis.

Artificial Respiration

A NEW SYSTEM of artificial respiration has been described by Dr. F. C. Eve of the Royal Infirmary of Hull, England.

Briefly it consists of laying the patient on a stretcher pivoted at its middle on a trestle and rocking up and down rythmically, so that the weight of the viscera alternately pushes the flaccid diaphragm up and down. The method has been found so efficacious in a healthy person that he need not breathe voluntarily—the procedure does it for him. It is significant that the amount of air expired with one rocking is 1500 c.c. while Schafer's method gives only 1000 c.c.—thus the new method would easily give more than 6000 c.c. of air per minute than is said to be necessary.

Dr. Eve was led to use this method on account of the occurrence of several instances where the Schafer method of artificial respiration could not have been tolerated because of the injuries or disabilities sustained.—Foreign Letters in *A. M. A. Journal.*

Psychology of Trauma

—Explanation and Classification of Attitudes of the Injured and Their Bearing on Compensation—

by

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THE TERM "traumatic neurosis" includes such a large number of psychic abnormalities that it serves as a poor working diagnosis. It is a fact that accompanying every injury there occurs a mental state that varies from the normal, and which may range from a momentary feeling of anger to a profound psycho-neurosis. Again, the degree of psychic abnormality is seldom in proportion to the degree of trauma; in fact it is generally in an inverse ratio; that is, the more insignificant the injury, the greater the psychic disturbance. The kind and degree of psychic disturbance is not in any way dependent upon the nature of the trauma, but it depends upon two other groups of factors: First, the circumstances under which the trauma occurred, and second, the mental make-up of the patient himself and his attitude toward his environment.

When a physician examines a patient who has recovered from the gross effects of his injury, but who still suffers from weakness, tremors, anaesthesias, pains, and innumerable subjective complaints it is to make the diagnosis of "traumatic neurosis." To treat such a patient for his nervous condition by means of drugs, physiotherapy, rest, and so on, is a waste of time and money. When confronted with such a patient it is our duty to learn, in a tactful way, all of the circumstances attending the injury, and also his mental attitude concerning these circumstances. In other words we should try to find out what is "eating on him." This is often difficult and at times impossible, but it is necessary before we can help the patient, or determine upon a form of settlement.

In order to be able to consider fully the various forms of abnormal psychic states following trauma we must consider three types of abnormal mental action: First, malingering, which is nothing but lying in order to gain some end; second, neurotic states which in many instances are nothing more than a subconscious form of malingering; third, the patient who has had an injury and who is also ill, and who ignorantly but honestly mistakes cause and effect.

The following classification will enable one to group those patients who show abnormal mental reactions following trauma:

A. Malingering
   1. In a normal person.
   2. In one who has sustained an injury
      (a) To gain more damages than the case justifies.
      (b) Recurrence of symptoms after losing job.
   3. Feigning of an injury in an ill person.
B. Neurosis following Trauma:
   1. True fear neurosis,
      (a) Fear of the agent causing the trauma.
      (b) Fear of using the part too soon.
      (c) Fear of recurrence, complications, etc.
   2. Defence reactions:
      (a) Self-serving.
      (b) Intolerable situations.
      (c) Revenge.
      (d) Self-pity and humiliation.
C. Mistaking cause and effect:
   1. Injury to a chronically ill person.
   2. Coincident injury and disease.

Malingering

IN A *normal person.* The normal person who is a malingerer is essentially dishonest and in order to build up a good claim almost always overstates his case. His exaggerations and inconsistencies brand him as a malingerer as he tells his story. Leading questions generally incriminate him still further. With the exception of the malingerer with expert medical knowledge, this type of person is readily diagnosed.

In one who has sustained an injury. Willful exaggeration of symptoms in a person who has had an injury is a common type of malingering in personal injury cases in those carrying accident policies. The inconsistencies between the type or degree of injury and the complaints make the diagnosis of the condition evident. Such a patient frequently states, several months after the accident, that the injured part "hurts him as much as it did the day it occurred." This is practically always a false statement with the exception of a stump neuroma. The recurrence of symptoms from an old injury in a person who has returned to work and then loses his job is generally as obvious as it is pitiful.

Feigning of an injury in an ill person. This type of malingering is unusual, but it occasionally occurs. The following case illustrates this type. The patient was suffering with a chronic spondylitis which was becoming more and more disabling. He apparently realized that he would soon have to give up his work. One

day he lifted a heavy piece of iron to his bench, cried out, and then called three of his fellow workmen and explained to them how he had sprained his back . He then went home and took to his bed. On the investigation of his accident he named his three witnesses who, after being questioned, developed enough evidence to show the whole procedure to be a frame-up.

Neurosis Following Trauma

IN PRACTICALLY every injury the patient develops some form of psychic abnormality. In most cases this may be very slight, but it is impossible for the average person to sustain any form of trauma, even the slightest, without also experiencing some change in his normal mental attitude. To illustrate this let us consider the various psychic changes that may occur in different individuals and under different circumstances. In all instances the trauma itself will be a constant factor. For example, let us assume that each patient has suffered a sprained ankle of the same degree of severity, causing enforced rest for about a week. All of the psychic reactions to be enumerated are not neuroses. In some cases the reaction may vary from the normal, but at the same time it may be a pleasant reaction. For example, our patient with a simple sprained ankle may have received the injury while saving a life, winning a football game or other form of heroism, in which case his mental reaction may be very pleasant, reaching the state of exaltation. He may receive the injury in a frightful automobile accident, in which he narrowly escapes with his life. His mental attitude is likely to be one of profound thankfulness that he escaped with only a minor injury. A person in strained financial circumstances, but who carries a substantial accident policy, may feel quite happy over an injury that will give him some financial aid. An old lady suffered a fractured spine with complete paraplegia. On examining her a few weeks later her cheerfulness was very surprising. Further investigation revealed that the injury prevented her from attending a disagreeable court trial that she had been dreading. The real neuroses following trauma are varied and complex, but with careful study they can generally be properly grouped. Most patients who suffer from the true "traumatic neurosis" may be classed under one of two headings; the fear neuroses, and the defence reactions. In some cases the patient shows characteristics belonging to both groups.

True fear neurosis. A fear neurosis may occur in a person who has never suffered an injury. A woman who has had a benign growth removed from her breast may develop a fear neurosis because she fears that the tumor was really a cancer and that it will recur. A physician who finds an occasional trace of albumen in his urine may develop fear neurosis lest he be developing a nephritis. Many examples could be cited of such cases, and if the fear is not removed by a rational explanation the person may become a neurotic invalid. Fear neurosis following trauma may be exemplified as follows: let us return to our standard injury, a sprained ankle. The patient sustains this injury under horrifying circumstances such as a serious train or automobile accident, falling from a great height, or being caught in a cave-in and being imprisoned for hours before being rescued. This patient's mental make-up is such that instead of being thankful that he escaped with only a sprained ankle, he dwells upon the horror of the circumstances attending the injury. If the accident occurred in a train, automobile or elevator he may refuse to ride in them again. A similar, and rather common example, is the patient who has escaped from the shock of a high voltage current. I have seen patients who received minor burns from high voltage currents who were recovering normally when some friend told them that they had received enough current to kill a man. Immediately the patient went into a profound state of fear neurosis, and kept as far away as possible from all electric wires and fixtures. A true fear neurosis due to horrifying circumstances is the hardest type with which to deal. Any treatment other than the erasing of the memory of the accident is of little value. Change of scene and work often help in these patients, but time is the only cure.

Fear of using a part too soon. Fear of using an injured part too soon is another type of fear neurosis. Our patient with the sprained ankle has recovered to the point when active use is beneficial, but on beginning activity he experiences a slight pain. From his mental make-up he abhors the least pain, and he also fears that the pain means that his ankle has not recovered sufficiently to use it. He therefore continues his inactivity with the result that the joint stiffens, the muscles of the leg and foot atrophy, and the bones of the foot and ankle show an osteoporosis. His fear neurosis will finally produce a real organic condition. Most of the so-called "hysterical joints" belong under this headline.

Fear of complications, etc. A fear neurosis may occur in one who dreads recurrence or complications such as inflammation or malignancy. The fear lest a back injury result in kidney disease, or that a head injury will lead to a mental disturbance are not uncommon. In a patient with a fear neurosis who also has the opportunity to claim compensation or damages, there is often either a conscious or a subconscious incentive to prolong the fears. The treatment of the latter two types of fear neuroses is to reason with the patient and try to argue away his fears. If there is a question of compensation or damages the sooner

this complicating phase of the situation is settled, the quicker will be the cure.

Defence reactions. The defence reactions include the next group of neuroses. In a case of fear neurosis the chief concern of the patient is his own body, but in the defence reaction the chief concern is something in the patient's environment. In some patients both conditions are acting together. The drafted soldier who develops shell shock while in a training camp first develops a fear neurosis from the possibility of having to be transferred to an unhealthy environment. He next develops some form of hysteria to keep from changing his environment. The defence-reaction type of neurosis is in reality a subconscious form of malingering occurring in an otherwise honest person. As a rule his symptoms and complaints are consistent. Usually the defence-reaction person is a much lower type of individual mentally than the fear-neurosis type. In most cases of defence-reactions following injury the injury plus the neurotic symptoms aid in some self-serving purpose. The unfulfilled wish and the unhealthy mental attitude may have been present for years ready to explode, and the trauma, no matter how insignificant, is the percussion cap that sets off the latent neurosis.

Self-serving defence reactions. Uncongenial employment is a very common cause for a defence reaction. The person hates his work, his boss or his fellow workmen. He puts up with this unpleasant environment hoping from day to day that something will happen to alter his situation. Suddenly he has an injury that allows him to stop work for a few days. This is the relief for which he has been hoping, and he subconsciously makes the most of it by becoming a neurotic invalid. The occurrence of defence reactions in order to escape unpleasant duties is common to most individuals. There are few who cannot remember the minor pains and aches of childhood that prevented them from going to school in the morning, and their quick recovery later in the day when it was too late for school. These self-serving pains while not due to an organic basis were, nevertheless, very real from a mental standpoint as long as they served a purpose. A perfectly normal adult when confronted with an unpleasant task may develop a headache or other symptom which if indulged in will offer an escape from the disagreeable duty. In the case of these self-induced symptoms the person has to manufacture the symptoms entirely out of his subconscious mind, but with a person who has a strong desire to escape from some duty or from his environment, and who then suffers an injury, no matter how insignificant, he has a most beautiful organic hook on which to hang his subjective symptoms and complaints. Such patients are generally easily recognized as suffering from a defence reaction, but to determine their particular aversion is often difficult. If these patients are made to feel that we really wish to help them they will frequently confess their aversion, or they will tell enough that we can guess it rather closely. After determining the thing from which they are trying to escape two lines of treatment may be attempted; either to help them to actually escape from their unpleasant environment, which can often be done by means of a cash settlement, or to help them by means of encouragement and advice to make the best of their lot.

Intolerable situations. Situations which to the individual appear intolerable offer a strong incentive for the formation of a defence reaction. In some persons their situation seems to them so hopeless that they escape through suicide. Less desperate persons seek escape in the development of a severe or spectacular neurosis. Others struggling under an apparently hopeless situation suffer an injury, which may give immediate relief, especially if another person can be held responsible for the accident.

Revenge. Revenge may be the basis of a defence-reaction neurosis, especially in those cases in which an injury occurs as the result of carelessness of another person, or when enmity exists between the injured person and the one responsible. The injury may be of the slightest, but it gives a subconscious excuse to work up a revenge complex in the hopes of some way getting even. A revenge-defence reaction is especially vicious in those cases in which the injured person is related to or so closely associated with the one causing the injury, that it is impossible for him to claim damages. In such cases the neurosis that develops is of such a nature as to make the party to the accident as miserable as possible. An example of such a situation is the following: A man and his wife, who were probably not as congenial as they should be, were at a party where, against her wishes, he drank too much. On driving home they had an accident in which she sustained minor injuries. From week to week her symptoms increased in number and severity until she became a chronic invalid, never letting the husband forget that he was the cause of it all.

Self-pity and humiliation. Any form of mental state that makes a person feel inferior may be the starting point for the development of a defence-reaction neurosis. We all feel temporarily humiliated when we injure ourselves doing something in a clumsy manner, or doing something wrong. Or we may have a feeling of self-pity if an injury prevents us from enjoying an outing that we had planned. But in the normal individual this feeling soon passes. In the introspective or self-centered person humiliation or self-pity may so overshadow all other mental pro-

cesses that he develops a defence reaction in the hopes that it will lift him out of his inferior state. An example of humiliation is shown in the following case: A middle-aged maiden lady who was a dressmaker specialized in making burial gowns for women. While making the final arrangements of a dress while the body lay in the casket, the undertaker's assistant passed by and accidentally touched the lid of the casket. The lid fell, striking the dressmaker's head and pushed her face against the chest of the corpse. She was immediately rescued and stated that she was uninjured. This experience was undoubtedly unpleasant, humiliating and difficult to erase from her memory. No symptoms appeared for several days, but during that time, in all probability, her subconscious mind was searching for a logical defence. Suddenly she manifested a full set of Parkinsonian tremors. During the investigation of this case it was found that a relative had been suffering from paralysis agitans for years. This gave our patient a disease picture to copy, but aside from the tremors she showed none of the other features of the disease. The resulting neurosis enabled her to collect enough damages to help erase the memory of humiliation.

Mistaking Cause and Effect

IN THIS TYPE of abnormal psychic process associated with an injury the essential mental process is not a neurosis but it is a mistake on the part of the patient in confusing cause and effect. The first manifestation of disease showing itself coincident or following an injury is a most frequent cause for controversy in compensation cases and personal injury claims. In such cases the patient may be perfectly honest in his belief that the injury either caused or aggravated his illness. In olden times almost every disease or bodily abnormality was considered to be due to malicious or evil influences or to abnormal physical surroundings. Almost every type of injury was believed to be able to cause almost every kind of disease and these superstitions of folklore persist today in many of our most enlightened patients. Almost every ill person tries to figure out in his own mind the cause for his illness, and as most persons suffer occasional injuries of more or less severity, it is very easy in the absence of actual knowledge of the true nature of disease, to blame the disease on the accident. This is not only seen in those trying to obtain damages, but it is almost universal. In most cases the lack of connection between the injury and the disease can be satisfactorily explained to the patient but when there is the opportunity to capitalize such a coincident in a damage or compensation suit it is very difficult or even impossible to show the discrepancy between the alleged cause and effect. The patient and his attorney want to believe it and as a rule it is not hard to find a physician who can devise a fantastic explanation of the connection which may appear plausible to the laity.

The occurrence of an injury to a chronically ill person. For example let us consider a man suffering from a chronic cardiovascular disease. He does not feel well but he is able to work. His condition gradually becomes worse, but from economic necessity he forces himself to get up and go to work each day. He then suffers a slight ankle sprain that requires rest for a few days or weeks. During this period of enforced inactivity he loses that daily urge to go to work, especially if there is any chance to obtain damages, he gives up entirely and by a very easy and natural process concludes that the sprained ankle is the cause of all of his disabilities. Almost every form of chronic disease has been the cause of litigation when associated with the above circumstances.

Coincident injury and disease. Coincident injury and disease or the first marked manifestation of a disease is a very common occurrence, but when this is mentioned in court the patient's attorney takes the attitude that such a coincidence is a most rare and chance occurrence. The fact is that most persons suffer minor injuries many times during a year while they may become ill only once in several years. If one makes a record of a person's illnesses over a period of years, and also a record of all of his minor injuries, it will be found that in the majority of cases the illness will coincide within a few days or weeks with the time of one of the injuries. Most workmen suffer almost continuously from minor cuts, bruises, burns or strains and think nothing of them, but with the occurrence of a disease it is very easy in their own minds to connect the two. Acute conditions such as apoplectic strokes, ruptured aneurisms, ruptured gastric ulcers, and kidney colic may occur coincident with or immediately following an injury. Such cases are very difficult to defend in the minds of the laity, but they are constantly occurring. A striking example of a coincidence that might have occurred is the following: A patient made an engagement for a minor operation for a definite hour on a certain day. Something came up making it necessary to postpone the operation. On the exact day and hour that the operation had been planned the patient while sitting in his chair died of a cerebral hemorrhage. If the operation had been done as planned the patient would have undoubtedly died at the same time and it would have been almost impossible to convince anyone that the operation had not been the exciting cause of death. Coincidences between injury and the chronic diseases are more common. The patient may pay little or no attention to the warnings of a beginning disease until

he suffers some accident which makes him take stock of his physical feelings. It is then very easy to combine the symptoms of his disease with the discomforts of his injury. The idea of one organ being affected by disease in another, the so-called "sympathetic pains" and the phrase "shock to the entire nervous system" as seen so frequently in legal complaints, serves as an aid to his misconception. The only solution in handling these patients who are deluded regarding cause and effect is to explain to them in detail the physical reasons for their mistaken ideas.

THE FOREGOING is simply a brief working outline for the study of those cases of injury in which the claims for damages are out of proportion to the actual injury. Every physician dealing with this class of patients will recall other subdivisions and combinations in the aforenamed groups. A better classification might be devised, but the aforementioned grouping will serve as a rough working basis in the evaluation of those patients showing abnormal psychic reactions.

If one keeps in mind the fact that almost every injury causes some mental deviation from the normal, and if while treating the physical injury the physician notes these abnormal mental attitudes, he may be better able to diagnose the cause of a neurosis if it should later develop.

Degree of Skill of Physicians as Interpreted by Courts

THE SUPREME COURT of Connecticut has placed a new and significant interpretation in a recent suit on the universally recognized rule that a physician should exercise the average degree of skill, care and diligence as used by members of his profession in the same and similar localities, in the treatment of patients.

In the quoted opinion it was declared that it was not unreasonable to require that a physician exercise skill similar to that of other physicians and surgeons in similar localities and that "under modern conditions there is perhaps less reason than formerly for the restriction of the skill required to that possessed by physicians and surgeons in the same locality, since there is no lack of opportunity for the physicians and surgeons in smaller communities to keep abreast of the advances made in his profession and to be familiar with the latest methods and practices adopted."

It is pointed out that for years leaders in medicine have emphasized the importance of constant and continous effort on the part of members of the medical profession to increase knowledge in scientific medicine and their skill in the practice of the art. When then the physician ceases to try to learn more about the intricacies of modern scientific medicine and to improve his skill in the application of that knowledge, he has reached the point where retirement from active practice is indicated.

The decision as rendered and interpreted indicates that there is little or any excuse for any physician not availing himself of the numerous opportunities offered for keeping abreast of the advances and progress of medicine; this the physician owes to his clientele as well as to himself and his profession.

It is noteworthy that this court at least has recognized that the difference between good, bad and mediocre medical service is not to any great extent a matter of geography, and this is evidence that those outside the medical profession are not unaware of the fact that the physician can keep abreast of medical advancement.—Editorial in the *Ohio State Medical Journal*, March, 1933.

Dentistry and Medicine

IN THE PAST 10 years I have many times discussed the relation of dentistry to medicine, and have long believed that the health of the mouth cannot be separated from the health of the body. Dentistry is, in fact, a branch of medicine, and consequently the dental surgeon should be a graduate in medicine who has specialized in stomatology.

A law requiring a dentist to be a graduate in medicine could not, of course, be retroactive; therefore, the dental surgeons already licensed would be allowed to continue to practice stomatology (dentistry). However some method should be devised whereby such a post-graduate course, to better understand the human body, could do so and receive a certificate for such work.

The prevention of the loss of teeth, the prevention of dental infection and the early discovery of mouth infection represent the highest aims in dentistry. To prevent diseases that emanate from mouth infection, the prophylactic work should be done by a *dental graduate* and not by an inferiorly educated person.

I am delighted that American stomatologists have finally succeeded in obtaining recognition of the fact that stomatology (dentistry) is a part of general medicine and surgery. It is now the duty of the younger men in the dental profession to join, also, the associations of gastroenterologists, and in their meetings to demonstrate the important part dentistry plays in this branch of medicine.

Ultimately, the great importance of the whole subject recognized as a separate section in the scientific divisions of the American Medical Association.—Oliver T. Osborne, M. D., *Clinical Medicine and Surgery*, March, 1933.

Carbon Dioxide

—Its Uses as a Liquid—

CARBON DIOXIDE is the best known and most widely distributed of all bottled gases. It is produced in enormous quantities by nature; natural product of all fermentation and combustion being the natural product of all fermentation and combustion processes, and according to certain scientists a blanket of carbon dioxide in the stratosphere is responsible for the living temperatures of the earth as compared with the colder temperatures of other planets. Its physical and chemical properties are too well known to discuss at this time.

During the past few years solid carbon dioxide development has naturally replaced the liquid product for certain uses, particularly in the refrigeration field. However, cylinder gas does and will retain many uses exclusively on account of its maximum purity and convenience.

The present normal production of carbon dioxide in cylinders is estimated at approximately 75,000,000 pounds per year. This is made by several processes, but the bulk of it is still made by the well-known coke process in some 40 plants operating in the United States.

The coke process[1] [2] is the natural by-product process, as it consists primarily of a highly efficient power plant generating enough power for its own use and at the same time taking its raw material from the flue gases generated under the steam boilers.

A considerable portion of the liquid production comes at the present time as a by-product from the manufacture of alcohols, and a small percentage is still recovered from natural wells. The purification of by-product gases is more difficult to control than is the coke process, and the production of natural CO_2 is a small factor, due to the inaccessible location of such natural supplies.

The uses of CO_2 can be divided into several general groups and will be discussed in the order of their magnitude.

Beverage Uses

AT LEAST 90% of the total production of liquid CO_2 is used in the beverage industry, for the production of carbonated beverages by both the soft drink bottler and the soda fountain operator. The main reason for carbonating beverages is to furnish the taste which has become popular in this country, and at the same time it performs other functions. Most authorities agree that carbonated beverages stimulate the gastric juices[3] and improve the appetite, which, coupled with a good advertising campaign, has popularized the so-called "three o'clock pick-up". Carbonation tends to bring out fruit and herb flavors and it has at the same time a preservative action on the product, which has made it possible for well-known companies to do a national business on ginger ales and root beers, since they have an almost indefinite shelf life when highly carbonated. Research[4] has shown that high carbonation has a definite germicidal effect on bacteria always present in such products, the beverage actually tending to become sterile upon standing.

Refrigeration

THE SECOND largest use for liquid CO_2 is in the refrigerating industry.[5] [6] Owing to the fact that practically all other well-known refrigerants are injurious to plant and animal life, carbon dioxide systems have come into general use where slight leaks or accidents would be dangerous to large assemblies of people, consequently it is used in theaters, hotels, hospitals, department stores and for the same purpose on many sea-going vessels. The entire charge of carbon dioxide from an ordinary refrigerating plant can be safely emptied into the engine room, as the amount can run up as high as 10 or 15%[7] in the atmosphere without danger, whereas fractional percentages of other refrigerants often cause death. The fact that it is heavier than air tends to keep leakage in the basements and prevents panics, as would occur through the leakage of the more irritating and lighter gases. Since it does not injure merchandise, it is gradually coming into use for cooling fur storage vaults, florist shops, and similar commercial establishments.

Carbon dioxide refrigeration is also becoming popular and often necessary in some of the newer industries requiring extremely low temperatures. By using another refrigerant, such as ammonia, for cooling the CO_2 condensers, it is commercially possible to operate the carbon dioxide system so as to produce temperatures a slow as 50°F. These temperatures are advan-

1. A. G. Wikoff, *Chemistry and Metallurgy*, Vol. 28, Vol. 1, January 3, 1923.
2. Howe, *Industrial and Engineering Chemistry*, Vol. 20, 1928, p. 1091.
3. Sellman, *Manual of Pharmacology*, W. B. Saunders Co., 1918, p. 606.
4. Donald, Jones, Maclean, *Am. Journ. Public Health*, February, 1924.
5. Pratt, *Ice and Refrigeration*, September, 1923.
6. Pratt, *Industrial and Engineering Chemistry*, June, 1932.
7. Sellman, *Manual of Pharmacology*, W. B. Saunders Co., 1918, p. 605.

tageous in connection with quick freezing processes and for the manufacture of other bottled gases. Certain ice cream manufacturers have also found that they can produce a better grade of cream by maintaining extremely low temperatures in their hardening rooms. This combination of two refrigerants, the two compressors often driven from the same motor, overcomes the high pressures required on ordinary carbon dioxide systems and materially increases the over-all efficiency, particularly with high temperature condensing water.

There has been prejudice against the general use of CO_2 as a refrigerant on account of the high pressures. Where comparatively cool water is available for condensing purposes it has been found that the over-all power requirement for all refrigerants is the same, and with present day construction methods the disadvantages of high pressure have disappeared.

Carbon dioxide refrigerating units are now made commercially in sizes from one-half to 250 tons capacity, and recently published[8] information giving accurate physical data on carbon dioxide has made it possible for engineers throughout the world to consider it in their calculations.

Chemical Uses

WHILE CO_2 is one of the main raw materials in many chemical industries, there are comparatively few processes which require the use of pure bottled CO_2. In many cases the cylinder product is used in the early experimental stages, with the ultimate result that when the process is put on a commercial basis it is found that lower percentages can be used and the manufacturer naturally turns to the production of his own CO_2 as purified flue gas giving approximately 15% CO_2.

On the other hand there are certain industries which definitely require higher concentrations or desire the convenience of the high pressure, and in these cases the bottled product continues to be used.

The rubber industry is a fertile field and considerable quantities are now being used in connection with the manufacture of tires, where it is found that the curing time can be reduced and quality improved by using an atmosphere of CO_2, and research is now being carried on which indicates that its use can be greatly broadened in the rubber field.

A comparatively large use for CO_2 has been developed in the last few years in connection with the aging of cement products. Portland cements ordinarily age through the absorption of CO_2 from the atmosphere, and in the case of small products such as cement shingle it has been found commercially advantageous to increase the rapidity of this aging process through the introduction of pure carbon dioxide. This process removes the possibility of spotting colored shingles by converting the free lime to the more insoluble carbonate inside the shingle—instead of the surface. This improvement in quality, plus the fact that it speeds up the manufacturing process and reduces inventories, makes it commercially applicable.

Small quantities are also used for the treatment of hard drinking waters, although in the larger installations purified flue gas has replaced the pure product. Other small quantities are used for boiler treatment, as the introduction of carbon dioxide into a heavily scaled boiler often changes the carbonates to bicarbonates, changing the solid mass to one of a spongy nature which can be more easily removed.

Pure carbon dioxide is being used to a small extent in the manufacture of Carter process white lead, and while certain manufacturers are using the diluted flue gas, there seems to be still some doubt whether the use of the more expensive material does not pay on account of better yields and improved quality.

Carbon dioxide has been used as a leavening agent for bread, but this has been discontinued as the public requires the yeast taste. Certain packers of food products use considerable quantities for preventing the oxidation of their canned goods by replacing their top air with pure CO_2, instead of depending upon the usual vacuum method.

Small quantities of the liquified product are still used in the manufacture of salicylic acid and as the vehicle for certain inflammable distillation processes.

Fire Extinguishing Purposes

CARBON DIOXIDE extinguishes fires as a blanket by excluding oxygen, and prevents them by diluting the oxygen content of the air below the combustion point. Most city fire departments now carry special CO_2 equipment, which can be used to advantage in basement fires or those occurring in other closed spaces. Wherever it can be used in place of water it reduces the loss, which in many cases is due more to water damage than to the actual fire.

On account of the danger of using water around electrical fires, carbon dioxide extinguishers are in general use in practically every telephone central station in the country for the handling of switchboard fires.

Experimental installations of automatic CO_2 equipment have been made in certain large generating plants for protecting the electric generators and for maintaining an atmosphere of CO_2 over transformer oils. Unfortunately for the carbon dioxide manufac-

8. Hunt, *Temperature Entropy Diagram in English Units*, 1930. Furnished on application to the Liquid Carbonic Corporation, Chicago.

turer, fires do not occur often enough in installations of this kind to give many actual tests, but as far as is known the automatic equipment already installed has functioned satisfactorily.

Comparatively large quantities of carbon dioxide are used for fire extinguishing systems on vessels of one kind or another. A well-known associate member[9] of the Compressed Gas Manufacturers Association has developed carbon dioxide fire extinguishing equipment to where it is in general use on many ships, from passenger boats to oil tankers. The advantages in using this gas rather than water for this work are many. It prevents damage to cargo, fills the lower sections of the holes first, driving the air out before it, and can be installed as an automatic system similar to the regular wet sprinkler systems in use throughout factory and office buildings.

This same member has been instrumental in developing extinguishing equipment for air plane service, even to the extent of making their own light weight cylinders. Another interesting development of theirs is an automatic life preserver inflated from a small cylinder of CO_2 when the aviator is thrown into the water by accident. This is required as standard equipment in certain branches of the United States Air Service.

While not of general commercial interest, coal bunker and coal mine fires[10] occasionally use large quantities of liquid carbon dioxide. The success of the results depends upon the physical location of the fire and on the ability to supplant the combustion supporting oxygen with the heavier carbon dioxide.

Mechanical Uses

ONE of the most interesting and rapid developments in the use of liquid carbon dioxide during the past few years has been its use in the mining industry, replacing high explosives.[11]

Its advantages are: first, safety; and second, a higher grade product, particularly in the coal mining field.

Small heavy steel cylinders in sizes varying in capacity of from one to four pounds each are loaded with liquid carbon dioxide under approximately 1,100 pounds pressure. The cylinder or cartridge as it is called, is equipped with a combination electric and chemical heating element and is placed in the bored hole in the mine exactly as a stick of dynamite would be used. Current is applied to the heating element which causes a very high pressure, breaking a heavy frangible disc, causing an explosion which heaves the mine seam. The explosion is slower than that generated by high explosives and for this reason, particularly in coal mines, a smaller percentage of fines is produced, with the result that the average product of the mine can be sold for a higher price. The safety feature of this process also allows miners to be operating near the section which is "shot" and considerable mining time is saved in this manner. The cartridges are not injured and are equipped with new discs and refilled for repetitive use.

In the good old days considerable quantities of carbon dioxide were used for the drawing of beer, particularly in the better class establishments. Flat beer is no more palatable than is a flat carbonated beverage and when beer is drawn with air the natural CO_2 in it tends to come out. If it is drawn with CO_2 the natural carbonation is kept in the solution. Whether the CO_2 manufacturers will have this market opened to them again in the near future is the big debate of the country at the present time.

There are numerous other mechanical uses for liquid CO_2, but none of them produce any great volume in themselves. With the general advent of spray painting, small quantities of our product are used for small intermittent operations which are not accessible to air supplies or where there is danger of fire.

One nationally known manufacturer tests large underground cables for leakage by applying CO_2 pressure, and many plumbers use it daily to blow out clogged piping.

Insecticidal Uses

SINCE most insects require oxygen for existence, carbon dioxide is coming into use in connection with the storing and treating of grains and cereals. Research work which is now going on in one of the universities indicates that the insect life in stored grains can be entirely eliminated by the use of carbon dioxide over long periods, but that these results can be produced more quickly and safely by mixing a small percentage of certain insecticides with the carbon dioxide. In the past a great many grain elevators have been treated with insecticides which were dangerous on account of either their inflammable or poisonous properties, and the new method obviates both dangers with equally good results.

In the same connection, the use of CO_2 eliminates danger of dust explosions in grain elevators and cereal factories, and most grain grinding is now done in an atmosphere containing enough CO_2 to prevent explosions; but here, unfortunately, purified flue gas can be used as well as the pure product.

Work is also being done to develop the use of household insecticides, using carbon dioxide as the mechanical power for spraying.

9. Walter Kidde & Co., 140 Cedar St., New York City.
10. Jones, *The Coal Industry*, June, 1923.
11. Cardox Methods. The Safety Mining Co., 307 N. Michigan Ave., Chicago.

As the effect of moderate percentages of carbon dioxide in the air is to increase the respiration rate, this property is used advantageously in the treatment of certain sicknesses. Hospital and public service companies equip their first aid squads with mixtures of carbon dioxide and oxygen for use in resuscitating victims of carbon monoxide poisoning[12] and in the hospitals it is used for treating certain types of pneumonia and heart diseases.

Carbonated baths, particularly some of the better known German baths, supposedly have their healing qualities due to the high percentage of CO_2 in the water, and equipment for carbonated baths in the home is now being offered by one or two companies.

Carbon dioxide gas is being used in many large cities at the present time for the humane killing of animals. Illuminating gas was formerly used for this work, but a fatal explosion occurred a few years ago and CO_2 is now being used on account of its safety.

IT IS HOPED that the foregoing brief outline of the present uses of liquid carbon dioxide will indicate new possibilities and that further research will develop larger fields for the manufacturer. Such research, as far as possible, should be restricted to uses which will require the virtually 100% pure carbon dioxide, manufactured by the members of the Compressed Gas Manufacturers Association.*

Vivisection

HERE let me frankly face criticism that has been directed against the methods of our laboratories, and has resulted in a most lamentable impediment to the advance of medicine. Without experiment on living animals, that advance, already greatly hampered, cannot continue. I recognize and endeavor to understand the motives which animate powerful bodies of noble and highly gifted men and women who are opposed to experimental methods.

No right-minded man ever wishes to inflict suffering upon man or animal. That is abhorrent to us all. Opposition to animal research, I firmly believe, is based upon lack of appreciation and understanding; as it is certainly supported by grievous and, I think, unpardonable misstatement. Day by day for many a year it has been my happy duty to operate on men, women and children, who now number a goodly company, in order to save life or bring relief. My heart is full of compassion. I cannot bear to cause or even to hear of suffering. Every one who has experience of laboratory work knows how little pain is inflicted, and what steps are always taken to minimize or abolish it. Yet the slight distress we must occasionally impose in our work upon man is greater in intensity, and far more protracted, than any suffered in our laboratories. It is simply not the truth to say that pain is wantonly, or unavoidably, inflicted there. The experimenter who excites suffering defeats his own aims, for pain changes the issues he seeks to discover.

Physiologists and surgeons are the most humane of men. The necessities of their work would impose this quality, if it were not already possessed. The whole antivivisection campaign, through a great testimony to the tenderness of heart of its supporters, has no slightest foundation in truth, and is a witness to their shut-mindedness and credulity.—Lord Moynihan, in "The Advance of Medicine," (*Clinical Medicine and Surgery*, March, 1933.)

Doctor and Patient

NOW, the problem is just this: This whole trouble between the doctor and patient was boosted on the public and the profession by irresponsible meddlers. It concerns centers where the needless cost was instituted and practiced. Your old general practitioner is all right; his patients are all right. He may not be making a decent living, but put this down: he is decent and he is living.

"Here is the remedy. Quit teaching young men that they are highly educated just because they know a lot of things that are not true, at least not yet. Let them know that being a general practitioner isn't so bad if you like your job of limiting suffering and every once in a while saving a life. Drawing a full house, making a grand slam, playing a game away below par isn't unknown in the lives of simple doctors who have lived all their lives in the hinterland. Let committees get the idea that 'by their work you shall know them' might be applied to hospitals. When we buy milk cows we do not inspect their faces; we study the amount and fat content of their milk. A small hospital with a good doctor will do good work, a big one with no clinical judgment may do a lot of poor work. You can standardize equipment, the formalities of education, but you can't standardize clinical judgment. Just allow a little institutional and personal autonomy and the high cost will be placed in a situation where it can be solved. It must be solved by doctor and patient. The high-powered sociologist only muddles things up. There is something between doctor and patient that you just can't chart. Every college should have at least one doctor on the faculty to teach the student that there is something ultra-microscopic in disease."—Dr. Arthur E. Hertzler, in *A. M. A. Journal.*

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12. Henderson, *Journ. A.M.A.*, September, 1924.
General References: Jones, *Canadian Chemistry and Metallurgy*, July, 1923.

* Paper by J. H. Pratt, The Liquid Carbonic Corporation read at 1933 Annual Meeting of C. G. M. A., New York City.

Health and Business Recovery

—Expected Changes in Employer-Employee Relations During the Period of Economic Reorganization—

by

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WITH THE imminent return of industrial activity those of us who are affiliated with large business organizations and are acquainted with the scope of employer-employee relations will be confronted with new problems, many of which will necessitate an outlay of substantial sums of money which will be difficult in the average company to secure on account of the trend of the times. None of us will want to recommend new things that require the expenditure of funds unless we are certain that they will be returned to the company in value received. Therefore, the sum and substance of this paper is to bring to your attention some of the factors governing a policy of conservation of employee health in the months to come during the period of business recovery.

When the gates of employment are reopened, there will be a flood of applications many times in excess of the actual needs of any industry. The recovery may be of long duration or it may be sudden—one guess is as good as another, but for industry I personally believe the former would result in the most good for both employee and employer. We will have more time in which to build slowly and more firmly.

These applicants, many of whom have been out of employment from one to four years, will bring to industry many new problems, and those routines on which we relied in the past will have to be revamped to meet the present needs. In the selection of prospective new blood for our organizations we will, of necessity, exert every possible caution in obtaining employees that will be an asset rather than a liability in the years to come.

By their enforced vacations away from the rules and regulations and out of the industrial environment, these applicants will have lost their old spirit of caution, not to say their ideas of discipline; all the practices and safety training that have taken years of education to instill into the average man and woman have suffered by severence from industry. The accident severity and frequency rate will increase greatly with reemployment as the returning workers will be anxious to show their ability and the desire to please will induce haste which is very apt to precipitate an accident. If good times return with a boom, then things being speeded up will see a large increase of accidents.

Many of these new employees have been denied the actual necessities of life, and by reason of this lack of proper nourishment, congested housing conditions, and with the worry of the future ever before them will carry into their new employment many potential factors that will make for accidents.

For every man that returns to work with enthusiasm and a willingness to give a good day's work for a fair money return, there will be another man who has learned to like his days of idleness and will be loathe to resume work with the correct mental attitude. This state of mind has been brought about by their relying upon support from relief agencies for money without being obliged to work in return for such help. When one's ambitions are dampened by long periods of idleness and the enthusiasm for employment becomes deadened, the mental faculties soon find themselves in a rut and it will take considerable time and education to revive the incentive to be an economic factor in industry.

ANOTHER result of long unemployment for any person is the lack of discipline and the observance of rules and regulations to which the individual was accustomed when formerly employed. They are less amenable to discipline and this should be borne in mind by those in authority when these workers resume employment. While they are unemployed they are out of contact with industry and it is only natural that they will forget some of the things that daily use and training have taught them. This will result in many breaches of discipline and due allowance will have to be made for infraction of industrial rules in the early days of their reemployment.

In the past we have always had the idea that there was too much radical talk among employees, regardless of the fact that they were in the minority. With the resumption of industrial activity we will soon learn that during the past four years the unemployed have experienced so many hardships that they are bound to have assimilated some so-called radical thoughts. Who will deny the fact that they have had some cause for such tendencies? The average man will be more suspicious of the employer and he will hesitate to accept industrial policies until his confidence is fully restored. Do not misunderstand my

position or think that it applies to the majority of industrial workers, for the fact is that it pertains only to the minority. There will be sufficient numbers of the discontented present to exceed those malcontents that were in industry prior to the depression.

The distrust of industrial management will have to be met by an open and aboveboard method of taking the employee into the confidence of the employer to show clearly that there are no ulterior motives back of the policy of the industry.

ONE of the brightest spots that shine from the gloom of the past four years has been the absence of any increase in illness or epidemic disease, especially among the unemployed. The percentage of sickness has been the lowest in years during the four years of industrial unemployment. Strange as it may seem, when men are denied the so-called luxuries of life on account of economic stringency, they are more prone to take better care of themselves in their daily life. They refrain from the over-eating, over-indulgence and abuse of their bodies which they are more apt to permit in times of prosperity when money is plentiful. This simply means that they are not so susceptible to disease on account of moderation of their habits.

While we have been fortunate so far as regards the health standards of both the employed and those out of work during the actual period of depression, I am firm in the belief that with the resumption of industrial activity there will be a reaction—development in the average person's state of health—and we will experience a decided increase in disease and illness. The condition is analogous with the experience learned from the World war. A great many diseases develop slowly and appear some years later after the emergency. I believe that we will see history repeat itself as regards this emergency of unemployment, much as I dislike to prophesy such things—nervous diseases and complications arising out of the mental stress through which the people have passed recently.

This possibility should prepare us with carefully thought-out measures to give some protection to industry as well as to be of aid to the employees. We will need the cooperation, at this point, of the medical advisor in our industry or the personnel of the medical department: Preemployment medical examinations of all prospective employees under a set standard of physical requirements for each work practice, securing the physically-fit man for the requirements of the work he is to do, and to fit the physically-handicapped worker in a position he will best be able to perform with safety to himself and those about him.

The previous superficial medical examinations so often found in industry will not be sufficient in the present order of things. Great care in the selection of physically-fit employees will be necessary, not only to prevent ingress into industry of physically-incompetent persons who by reason of physical make-up become accident-prone, but by reason of the possibility of disease conditions and injuries developing in persons formerly unemployed and bringing this liability into the industrial organization, not to develop into actual disabilities until years after the emergency. Careful supervision of employee health will be invaluable in detecting those quiescent physical conditions in time sufficient to institute curative measures before they are actually resultant in severe illness or injury.

OUR RESPONSIBILITY and vigilance is not to be lessened after employee selection and preemployment physical examination, but we must be alert to detect developments of special and physical conditions before they become severe. This may be accomplished by periodical medical examinations made under strict standards of physical requirements as to what constitutes physically-fit men and women for the work they perform.

Should industries be lax in supervising the medical policy of the employees, they will, within a very short time, experience an ever-increasing rate of absentation from work on account of illness which carries with it economic loss to both employee and employer. Every change of workmen in an industry can be figured as a loss and, too, with each new employee we assume an unknown liability as far as safety in operation is concerned. Your old employee is a known value and his education in your company means the past outlay of many dollars to make him a safe and efficient worker. Keep him in the family by all means. Where physical defects predominate in employee personnel, one finds change of occupation frequently due to defective physical conditions.

With the increase of absentation from work on account of illness goes an increase in the cost of the employee sick and health benefit to industry. No longer will these "benefits" be operated with the laxity and false sentimentalism as was often witnessed during the "boom" years in the past. More careful scrutiny will be given by the financial officials of industry to the costs of operation of the benefit for the possibility of their assuming such outlay of funds as to be an actual menace to the financial set-up of the industry. Likewise, this same danger applies to the pension system in industry at large.

Careful supervision of employee sick and health benefits will of necessity be imperative, with a prompt reporting of all employee claims within a short period after cessation of actual work and a careful medical check-up of the claimant by the med-

ical department personnel or the industrial medical officer. All this means a closer cooperation between the employee's physician and the medical officer of industry, to the end that the employee will receive such adequate medical attention as will assure his early return to an economic standing in the shortest possible time consistent with safety to the employee.

Those estimable people in charge of employee sick and health benefits will need to seek assistance from their medical departments more frequently and ask their cooperation daily instead of in unusual conditions, as in the past. May I say here, that there must be no usurping of the prerogatives of either the employee relations department or the medical department; both are working for the interests of the same company and employee and departmental jealousies have no place in a well-managed industry.

Here, again, the periodical medical survey of employees at regular intervals will be an asset to industry and value returned in proportion to the sincerity and efficiency in which it is conducted. Some people are prone to expect wonders from a medical reexamination of employees the first year it is in progress and are disappointed if their claim costs for sickness are not greatly reduced. The contrary effect is produced, by reason of the detection of many incipient diseases which necessitate treatment, with resultant increase of claim costs. These same disease conditions left to themselves would eventually come to be reflected in increased benefit costs because the period of disability would extend over a longer period of time. The real value of periodical medical examinations is not to be realized until, with the advancing age of the employee personnel, under the years of medical supervision, the claims for sickness become greatly less than would otherwise be the case without this medical check.

THIS ABSENTATION from work on account of illness will parallel the absence from work on account of convalescence from complications resulting from so-called trivial injuries while on duty. During the past four years many disease conditions and injuries have developed for those people out of employment with the result that, when business activity is resumed on a large scale, these conditions will be taken into industry. If no preemployment medical audit of the incoming new employee is made, or these previous conditions are not discovered, then, in the event of subsequent injury or unusual occurrence, they will flare up and be the cause of prolonging the period of recovery. They may also cause an otherwise trivial condition to be of a serious or fatal outcome. This aggravation of a preexisting condition may result in a prolonged period of economic loss. This possibility is doubly more important in personal injury to a customer or an employee from the claim department standpoint.

Constant medical supervision of employees that shows unusual occurrences, such as discourtesy, clerical errors, work mistakes, falling asleep on the job, late reporting for daily work, outbursts of temper, loss of efficiency, low production rate, and many other occurrences, can many times be definitely corrected by the proper type of medical policy and the employee saved for the company. This cannot be accomplished unless the services of the medical officer are requested when these occasions arise. Many peculiar things occur which are directly due to physical unfitness, and many an injustice has been done to the employee by discipline which would not have occurred had there been an understanding of the underlying conditions.

SO FAR we have dealt with the prospective employee who has been on enforced idleness for a greater or less period of time and have said nothing that relates to those employees who have been retained in the service of industry. There is no difference between the two except one has had work while the other has not. The one who has been constantly employed has likewise experienced hardships and restraint in indulgences the same as the one unemployed. Many employees have been doing the actual work of two or more persons. Their efforts are more sustained and the fatigue element is more apt to be present both mentally and physically. While employed their responsibilities have been increased many time far in excess of their ability. Their fears and worries have increased and all this has taken toll of their reserve nervous energy.

Many former recreations and periods of relaxation have been denied them. Vacations have been eliminated and many have become "portfolio workers" (taking home at night large amounts of work that they could not do during the regular office hours). All this saps the strength of the average worker. The same applies to our present day methods of education. So much is attempted in school hours that there is no time for study other than at home. When will we awake to the harm done by cramming the brain with education at the expense of the physical body? Is it any wonder that we have many of the college graduates emerging with an over-abundance of education and an under-nourished and depleted physical condition to cope with and carry on the exacting duties of business competition?

When industrial activity begins, the reaction to this overwork in the employed person will be as great as the reaction experienced by those who were formerly idle. I believe the reaction will be greater

to those who have been carrying on during the past years with their increased burdens because they have had no relaxation from their mental and physical effort while the unemployed worker has had at least the opportunity of relaxation of physical body as well as mental state. The employed man's worries and fears have been constant and, under stress of employment responsibility, added efforts are prone to have mental and physical breakdowns when the reaction sets in after business improvement.

With the possibility of increased disability and absentation from work of the employee retained in service, the results will be more costly and serious due to the fact that those retained in industry were largely key men and it is upon this skeleton organization that many companies depend to build up their respective organizations. It will be hard to replace these people and we must not lose sight of the fact that they at the same time are growing older and their reserve strength diminishing.

We realize that during any financial stringency those who are separated from the company first are usually those last entering the service and the youngest in point of age and the best as pertains to physical fitness. Many industries have retained their oldest employees and likewise their most valuable, which is as it should be, but those retained employees daily become older and less resistant to disease and their useful longevity is shortened. There is likewise only a small proportion of youth and young blood left on which to build and with which to transfuse new life into the organization after revival is at hand and old standbys begin to retrogress and become incapacitated on account of added burdens of responsibility. This in reality brings prematurely to periods of disability the old employee much sooner than would be a fact in normal times.

HERE AGAIN arises the source of increased sick and health benefits and pension costs. The most careful supervision must be had to aid the old employee to react to the changes of renewed business activity. Medical supervision of old employees should not be minimized during periods of economic depression for it is more essential during hard times than at any other time, and we pay doubly for a mistaken idea of economy. Here, it may be said that among the first activities in some industries that were curtailed or dispensed with were such as employee relations, medical departments, safety groups, employment departments, etc.,—as it was often stated that these were not income-producing activities. Those companies who had established medical policies for employee conservation of health and who had learned the value accruing to their companies of a competently equipped medical department reduced this work in proportion to the reduction in employee personnel.

We cannot impress too emphatically the need of close study of the problems of sick and health benefits and pension plans at this time and we must withhold retiring our employees until they are actually superannuated and unable to perform any further work. What is a better pension, may I ask of you, than the knowledge of work being available for as long a period of time as my physical condition will permit? Help maintain the old employee in actual employment in some capacity in your company until he is further unfit for any work. These easier positions are soon discovered by a job analysis of your industry. How much happier is the old employee when he is gainfully occupied at some definite work than when he is idle with only time on his hands and living on a pension, many times nominal!

WE HAVE OFTEN heard officials and department heads remark that they have no such thing as light work or any position available except for a man who is perfectly well. They often recommend placing the employee on the sick and health or benefit roll or request that he be pensioned, which is more often more costly than retaining him at some lighter occupation.

We cannot rely on actuarial records as to longevity of employees on pension rolls, as past experience in large industries has shown a large proportion of those retired on pensions have outlived their life expectancy and many are gainfully employed on other payrolls. If these employees on a pension are fit to work for somebody else and give satisfactory service, then they are not superannuated and are fit to be retained on the payroll of the company pensioning them.

You may visit any shop, office, plant or industrial unit and you will find young, robust, healthy men and women performing work of such a nature that could efficiently be done by those older and prospective pensioners. I do not include what is called skilled crafts or specialist service rendered by the younger employee as prospective positions for the less accomplished old-timer. This statement may be open to argument by those whose theories on pension are different from mine, but a job analysis made without fads and fancies will prove the assertion of available positions in almost any business that will provide for the old employee.

IDEAS governing pensions, sick benefits and other relief problems in industry will undergo radical changes in methods of conduct within the near future. There is none of us who knows all there is about any one subject, no matter what we think of ourselves and

our abilities, but how often is a decision made on mere statement of words without actual investigation and study? Especially is this true where there is one-man authority whose opinion is final. On such matters as employee relations, I firmly believe that the value of any given employee relations department is its ability to maintain the employee as an economic factor with the company for the greatest length of time. I have rated the value of the doctor in industry in a like manner. His value is shown by his ability toward maintaining the employee in a healthful state with the company over the greatest period of time instead of his ability to detect conditions and recommending elimination of the employee.

The average man or woman does not relish outright charity, sympathy or anything that smacks of patronage. The person who is given a pension before he is actually superannuated is the recipient of a so-called "bonus" for his past work with his company. The true definition of a pension as "a stated allowance for past services," is, to my mind, a fallacy. The term should include the element of "retaining the older man within the service of his employer as an economic factor."

To maintain the cost of pensions within a reasonable limit we must first exhaust all means of retaining the employee at a gainful task within our family. First, accept into service those employees (men and women) who are physically fit to perform the work at hand in the most efficient, safe and healthful manner. Through a policy of conservation of employee health by periodical medical examination, aid the employee in maintaining a healthful state of mind and body. When age and physical condition become such as to impair his efficiency and safety in his regular occupation, then, through the medium of a job analysis, place him at work where he still can function for a time as a part of the company. He will live longer and be happier among the old scenes and be with his old friends doing something useful instead of being idle on a small pension, alone with his thoughts, awaiting the close of his life.

WHEN the physical condition becomes depleted and active work cannot be done, place the sick employee on the sick and health benefit or insurance roll until he regains fitness for some task, or if there is a life policy in force with the industry and he is still within the age limit, give him a part of that policy as permanent disability. With the using up, say, of a part of this insurance in the form of disability payments, he may be superannuated and placed upon the pension roll or annuity. His expectancy will not be a matter of speculation. His pension or annuity will in fact be more substantial than he would get under the present pension set-up and it would not be as large a drain on the industry involved. In fact, it might easily become an operating charge. Some will say that this is a hard-hearted or mercenary attitude and that each of us is entitled to a rest in our old days as a reward for good and faithful service to our employer.

In regard to the attitude of the old employee desiring to remain with his company for the greatest length of service, I can only speak of my own experience of the past 20 years and a knowledge of acquaintance with a large group of people who have been pensioned by one company or another.

For the greater part, this suggestion has been derived from those who are on pension and who do not know what to do with their enforced idleness or leisure. Personally, through our medical department during the past 20 years in the examination of many employees of various companies for the purpose of superannuating them on the pension or annuity roll, we invariably have the employee plead not to be found unfit to work with his company, and the greatest anxiety that he will have is to be placed upon the inactive list. I can recall very few employees during this number of years who were elated or glad to become inactive with a pension.

We have approved many of these candidates for annuity as being physically fit to continue in active work of some capacity with the companies and our theory of work as the best tonic for one, especially in old age, has been borne out by these same old employees—many still in actual service, doing their bit safely and efficiently and still not on pensions.

Very little has been said in relation to the mentality or state of mind of the unemployed at this time or what we will find predominating in the mind of the worker when he returns to normal business life. There is a frequent statement heard that there will be a trend to radical tendencies on the part of the returning employee. This is simple conjecture, for, why should any man wait until he is gainfully employed and has resumed the enjoyment of those things previously denied him by unemployment to demonstrate his change to radical thoughts? No, this is contrary to fact, for the time for demonstrating any radical action, were he so inclined, would be when he was out of work with actual suffering and hardship confronting him. The fact that, during the past four years of unemployment, with their attendant hardships, there have been no scenes of general discord or disturbance on a large scale, is due to the orderly state of mind of the average man and woman unemployed. The world might well be proud of the manner in which the unemployed in the United States have conducted themselves during these trying times

and are excellent examples for the rest of the world to follow. There will naturally be a better feeling of happiness and content with the realization that the "bad times" are behind them and "good times" in the future for all men and women returning to employment.

With the passing of the work novelty to many now unemployed we will find the employee body quietly listening and studying with careful thought all that is going on about them in their particular industry. There is a possibility that they will accept from their employer only those things that they understand clearly and of which they know the true facts. They have been through a lot during the past four years. They have had considerable amount of time to read, to become acquainted with others, and they have broadened their understanding and vision of public affairs and business conditions. They will be in a more analytical frame of mind than ever before. They will be hesitant in the acceptance of those things which in the past were held out to them to be for their benefit and welfare and which at the first dawn of depression were denied them by elimination when they really meant something to the employee.

EMPLOYEE RELATIONS during the next decade will afford the greatest opportunity for those engaged in this work to make a name for themselves and in devising ways and means toward making the employee a very valuable asset to the employer. Many new angles and problems will arise for which we will have no precedence and which cannot be solved by past experience and former methods. It will tax our ingenuity to the utmost to meet them. Preparation to meet them as they arise should now be our sole intention and a careful study now put forth to become acquainted with the facts before industrial activity has fully returned.

The offering of services of one nature or another as a reward through employee relations will be searchingly analyzed before they are accepted. Mutual confidence will of necessity have to be restored and those things undertaken without enlightening the employee personnel will not have the cooperation desired. By all means, explain and demonstrate the true facts of your business to your employees, then they are in a better position to explain in an intelligent manner to the public—your customers—questions that they are asked. Public relations for any company depend on the state of employee relations. Where a company employee personnel is suspicious, skeptical and fails to cooperate with the management, you will likewise find that company under criticism and distrusted by the customer and the public at large.

FINALLY, I believe that one thing that makes for better employee relations is the establishment of a definite medical policy of employee conservation of health. Where such a policy is established and efficiently conducted by a competent medical personnel, you will find its value reflected daily through employee morale and cooperation. I know of nothing you could better direct your efforts and minds to than a study of the cost of medical service of the employee. In time of illness, when least expected, it is usually a very expensive matter to be sick, and especially if hospitalization is necessary. Your own medical policy for employee health will be a marked factor in reducing the number of preventable disease conditions from becoming expensive burdens to your employee family. In time of sickness one needs and desires comfort and the knowledge that some definite aid will be forthcoming to them in their emergency will greatly cement good employee relations. If it is to be offered as a sop for some ulterior motives as regards employment, then it is better that it be left out of the picture of employee relations.

Heliotherapy and Surgery in Tuberculosis of Bones and Joints

DRS. A. M. LEHMAN AND D. C. BARTHOLOMEW of the Medical Corps of the U. S. Army, Denver, state in the *Journal of the American Medical Association,* April 16, 1932, that heliotherapy has proved itself to be of the greatest value in the treatment of tuberculous spines and hips, but for unknown reasons is ineffective in involvement of the knee joints. This clinical experience is based on 117 cases of tuberculous spine, 27 of the hip and 11 of the knee joint.

It is believed that bony anklylosis is the proper criterion of arrested diseases in adults and probably in children.

From the experience of these investigators, fusion operations are valuable adjuncts in the treatment and should be employed in well-chosen cases of tuberculous spine and in all cases of tuberculosis of the knee. In the case of tuberculous hips, it is thought that operative measures should be tried only in carefully chosen cases in the hope that recovery time may be shortened. The most important complication and the one that produces the greatest number of fatalities is sinus formation with secondary infection; treatment, therefore, must be planned to avoid the formation of sinuses, which if avoided the death rate falls to almost negligible figures; on the other hand if sinuses develop they become of more clinical importance than the original bony lesion.—*Clinical Medicine and Surgery,* March, 1933.

One Hundred Books for the Doctor

—A Special Selection of Recent Titles—

A PRACTICING physician who makes books and literature his hobby, writing under the pseudonym of "The Medicine Man", (in the *Bulletin of the Wayne County Medical Society,* Detroit), has again, for 1932, listed 100 books which will be of interest to doctors. These books will also be interesting to the wives and sweethearts of physicians, as well as nurses, internes, medical students and even non-medical friends. There is no order; the titles have been listed as they were gathered:

1. *"A Man Named Luke."* March Cost. Story of a cocainist. Surgeon Cunningham is drawn with the few powerful strokes of a master.

2. *"Almost a Scandal."* Dr. Harris H. Luritz. Story of the modern sophisticated life in Hollywood.

3. *"Opium."* Jean Cocteau. Confession of a modern opium-eater.

4. *"Magnificent Obsession."* Lloyd C. Douglas, D.O. The scene is in Detroit and nearby, and the chief characters are doctors and hospital life. This book has had a great vogue and is still going strong.

5. *"Medicine in Africa."* The real title is "On the Edge of the Primeval Forest." Experiences and observations of a doctor in Equatorial Africa. Dr. Albert Schweitzer started out a D.D. but became an M.D. so that he might minister to the natives of Central Africa in a district where sleeping sickness was rampant. His wife qualified as a nurse and went with him. A book about a really great man.

6. *"Luxury Liner."* Gina Kaus. Translated from the German. Story of a doctor whose wife ran away from him and his meeting with her and her lover on the steamer. A novel of outstanding qualities.

7. *"The Clinic of Dr. Arcadre."* Muriel Harris. The extraordinary story of a doctor who lives like a monarch dominating his little world, until his power is stolen by his peasant mother-in-law.

8. *"Man and Medicine."* An introduction to medical knowledge. By Dr. Henry E. Sigerist, Professor of Medical History of the University of Leipzig. Every doctor and medical student should read this most interesting and authoritative book. You may recommend it to your lay friends. A wonderful gift book.

9. *"William Shakespeare, M.D."* Harry B. Epstein, M.D. A unique and colorful study of the scientific and the literary.

10. *"Inmate Ward 8. Behind the Walls of Delusion."* A human document telling of life in an insane asylum written by a brilliant newspaper man. Read and think.

11. *"Etzel Andergast."* Wasserman. Translated from the German. Not an easy book to read. The biography of Joseph Kerkhoven, a Berlin doctor. It may remind you of Tolstoy.

12. *"District Nurse."* Faith Baldwin's romance of an East Side angel.

13. *"The History of Paediatrics: The Progress of the Study of Disease of Children up to the End of the 18th Century."* George Frederic Steel, M.D., London. An excellent book for specialists or those interested in medical history.

14. *"The Lame, the Halt and the Blind."* Howard W. Haggard, M.D., needs no word.

15. *"Lives."* Gustav Eckstein. Read about the hairless macaw, the tortoises and other animals. You know Eckstein also wrote the best life of Noguchi.

16. *"The Scorpion."* A very fine handling of the delicate subject of homosexuality.

17. *"A History of Smoking."* Count Corte. Many doctors smoke, so you may be interested in how the habit started among the Mayan priests of Yucatan.

18. *"The Frontier Nurses."* Ernest Poole tells of the work done by Dr. Mary Breckinridge and her nurses in the mountains of Eastern Kentucky.

19. *"Osler and Other Papers."* William Thayer. Interesting to all lovers of the Great Physician.

20. *"A Doctor of the 1870's and 1880's."* William Allen Pusey tells the story of his father's life as a country doctor.

21. *"The Secret of the Morgue."* Frederick G. Eberhard. A gruesome mystery for the lovers of this type of story.

22. *"Mental Healers."* Stefan Zwieg. Here you may learn about Franz Anton Mesmer, Mary Baker Eddy and Sigmund Freud.

23. *"A Cuckoo in Harley Street."* Sidney Fairway. This is a story about a doctor who is a scoundrel. The author also wrote "The Doctor's Defense." Both books come from England.

24. *"Absolution,"* by the author of "Ex-Jesuit," Dr. Boyd Barrett. He was formerly a Jesuit priest and is now a well-known psychoanalyst. A study of the secret places in the human mind.

25. *"Murder at Midnight."* R. A. J. Walling. The murdered man is a doctor who knows too much about a dope gang.

26. *"Sexual Life in Ancient Greece."* Hans Lieht. The first study of that side of Greek life without which an understanding of Greek art, literature, politics, religion and philosophy remain incomprehensible.

27. *"Hygiene of Marriage."* Dr. Millard S. Everett. One of the frankest and broadest in its scope.

28. *"The Wisdom of the Body."* Dr. Walter B. Cannon, Professor of Physiology in the Harvard Medical School. He shows how we may stay normal. Also by the same author: *"Bodily Changes in Pain, Hunger, Fear and Rage."*

29. *"Pathfinders in Medicine."* Victor Robinson, M.D. Has many illustrations, and he tells us of medical leaders from Galen to Pavlov.

30. *"Essays in the History of Medicine."* Karl Sudhoff, M.D. Fascinating essays covering all sorts of subjects from prehistoric times to the present day. From the pen of the master of medical history.

31. *"The Story of Medicine."* Victor Robinson, M.D. The story of scientific medicine from the medical man to the modern physician.

32. *"The Physician of the Dance of Death."* The late Alfred Scott Warthin, M.D., of Ann Arbor. Historical study of the evolution of the Dance of Death Myths in Art, throughout Six Centuries. A great book.

33. *"Classic Description of Disease."* Ralph H. Major, M.D. Here the doctor will find 376 selections from the original epoch-making accounts of 179 authorities whose contributions have furnished the foundation of our knowledge of chemical medicine. A source book for every doctor and medical student.

34. *"Sixty Centuries of Health and Physick,"* S. S. Blakeland Stubbs and E. W. Bligh. The progress of ideas from primitive magic to modern medicine.

35. *"Autobiographical Sketches."* Elizabeth Blackwell. Not a new book. A story of the first American Woman M.D. A story to appeal to every doctor, male or female, and every woman interested in the struggle for women's rights. Old, but excellent reading.

36. *"Stalkers of Pestilence."* Wade W. Oliver, M.D. The story of man's ideas of infection.

37. *"History of Haitian Medicine."* Robert P. Parsons, M.C.V.S.N. A thrilling story of what has occurred in the black republic.

38. *"Peaks of Medical History."* Charles L. Dana, M.D. An outline of the evolution of medicine for the use of student and practitioner.

39. *"Kamongo."* Homer W. Smith. The story of the lung fish. Good reading. Evolution vs. religion.

40. *"Man's Redemption of Man. A Lay Sermon, McEwan Hall."* Sir William Osler, M.D. The greater part of the sermon is devoted to the wonders wrought by the science of medicine during the past half century.

41. *"Foundation of Medical History."* Sir D'Arcy Power. This is the first book from the newly founded Institute of History of Medicine at the Johns Hopkins University. A book you will enjoy.

42. *"The Insanity Plea."* Edward Huntington Williams. Here is handled without gloves the "medico-legal farce comedy" by an alienist of long experience.

43. *"The Young Man and Medicine."* Lewellys F. Barker, M.D. A good book for those who are thinking of studying medicine.

44. *"The Medical Sciences in the German Universities."* A study in the history of civilization. Translated from the German by Theodor Billroth. With an introduction by William H. Welch.

45. *"Acute Cases in Moral Medicine."* Rev. Edward Burke, M.A., Ph.G. This unusual book enters into the field of moral medicine.

46. *"A Short Life of Florence Nightingale."* Sir Edward Cook. This is a one volume edition revised by Rosalind Nash from the "Two Volume Life."

47. *"Epidemiological Essays."* F. G. Crookshank, M.D. In this collection of essays the author discusses epidemiological problems from the time of Hippocrates to the present day.

48. *"Medical Education. A Comparative Study."* Abraham Flexner. A comparative study of the medical schools in the United States and Europe.

49. *"Sex Lore."* S. Herbert. Not new but a good book for teaching of sex to young people in their own reading.

50. *"Reluctantly Told."* Jane Hillyer. The story of a mental breakdown which the author herself suffered.

51. *"How's Your Blood Pressure?"* Clarence L. Andrew, M.D. Written in a style the layman can understand.

52. *"Courts and Doctors."* Lloyd Paul Stryker. A book every doctor should read, especially in these days of so many malpractice suits.

53. *"Folklore of the Teeth."* Leo Kanner, M.D. All you want to know about superstitions, traditions, proverbs, songs, legends, charms, etc., that center about the teeth.

54. *"Certain Samaritans."* Esther Pohl Lovejoy, M.D. A story of what women have done in the battlefields.

55. *"The Infancy of Medicine."* Dan McKenzie, M.D. An inquiry into the influence of folklore before the evolution of scientific medicine.

56. *"Fear."* John R. Oliver, M.D. This book discusses the importance of the symptoms of fear.

57. *"Pasteur and After Pasteur."* Stephen Paget, F.R.C.S. This is the first volume in the new Medical History Manual.

58. *"Doctor and Patient."* Papers on the relationship of the physician to men and institutions. By Francis Weld Peabody, M.D.

59. *"Rolleston. The Life of Sir Thomas Clifford Allbutt. A Memoir."* Sir Humphrey Davy Rolleston. A study of the life of this eminent physician and scholar.

60. *"Leadership."* William C. Rucker, M.S.M.D. A small book setting forth in practical form the principles underlying leadership in any rank of military or civil life. A good book for the young man.

61. *"Finding Themselves."* Julia C. Stimson, M.D.R.N. The letters of an American army chief nurse in a British Hospital in France.

62. *"Medieval Medicine."* James J. Walsh, M.D. The story of the medieval sciences in the Middle Ages. A most interesting book which will change your ideas of the Middle Ages.

63. *"Captains of the Watch of Life and Death."* Mabel Osgood Wright. A book about trained nurses and untrained patients.

64. *"Four Centuries of Medical History in Canada."* John J. Heagerty. For all those who were born and educated in the "Land of the Maple Leaf."

65. *"Medicine, Science and Art. Studies in Interrelation."* Alfred E. Cohn. Out of the ordinary.

66. *"History and Bibliography of Anatomie Illustration."* Liedwig Choulant. Translated from the French.

67. *"The Thinking Machine."* C. Judson Herrick. A popular account of how the brain works.

68. *"Life of Mendel."* Hugo Iltis. At last a book in English about this Austrian monk who founded the science of eugenics.

69. *"The Love Doctor."* Lillian Bennett-Thompson and George Hubbard. He used the most dangerous medicine—love.

70. *"The Curative Value of Light, Sunlight and Sun Lamp in Health and Disease."* Dr. Edgar Mayer. He sets forth the values and dangers of the sunlight. An excellent book in this day of sunburn addicts.

71. *"Red Mother."* Frank B. Luderman. The life story of Pretty Shield, a medicine woman of the Crows; a story of the old days in the plains.

72. *"Ether and Me."* Will Rogers. Enuf.

73. *"Leaves from My Life."* Dr. E. J. Dillon. A thriller. He probably knows more about the ways of Europe than any other man.

74. *"Mr. and Mrs. Pennington."* Francis Brett Young. You know he is a doctor by training.

75. *"Prison Doctor."* Louis Beig, M.D. A story that only a prison doctor could tell about the stepchildren of society.

76. *"The Doctor's Defense."* Sidney Fairway Kimsey. The story of Dr. John Witwell, who sacrifices his honor and reputation for his son.

77. *"The Challenge of Love."* Warwick Deeping. M.D. can be placed after his name. The hero is a young doctor.

78. *"One Drop of Blood."* Anne Austin. Dr. Carl Koenig, the noted psychiatrist, is murdered. Go on!

79. *"Hospital."* Rhode Truax. The story of a young surgeon. You may like it—or you may not!

80. *"And Life Goes On."* Vicki Baum, the author of "Grand Hotel." Again a doctor is the central figure.

81. *"The Art of Being a Woman."* Dr. Olga Knopf. The problem of women from birth, through adolescence, to marriage and later life. Very frank.

82. *"Miracles of Healing."* J. Ellis Barker. A defense of homeopathy.

83. *"The Genius of Louis Pasteur."* Piers Compton. This biography of Louis Pasteur will appeal alike to the scientist and the general reader.

84. *"The Doctor's After-Thoughts."* Sir James Crichton-Brown. A random set of tales, aphorisms, morsels of science, etc., from his note books.

85. *"The Use of the Self."* F. Matthias Alexander. Read how to manage yourself.

86. *"The Good Shepherd."* John Rathbone Oliver. The story of an American physician who, to live down a mishap in early life, goes to an imaginary Tyrolean village to redeem himself by following in the footsteps of the Great Physician.

87. *"The Conjure Man."* Dr. Rudolph Fisher, a negro physician. A great mystery story.

88. *"The Green Knife."* Anthony Wynne. Dr. Harley solves the problem of the murdered millionaire from a pile of brass shavings.

89. *"The Maniac" by?* A true story of what befell the author during a five weeks' attack of acute mental disorder.

90. *"The Joy of Ignorance."* T. Swann Harding, M.D. The doctor is on the job again.

91. *"Frauen, Aus Dem Tagebuch Einer Arztin."* Dr. Elsie Kienle, Berlin. The author spent time in jail for violating paragraph 218 forbidding abortion. German.

92. *"Dr. James Barry."* Olga Racster and Jessica Levi. Said to contain enough hairbreadth escapes to satisfy anyone.

93. *"What We Put in Prison."* Dr. S. W. Pailthorpe. Story of what a woman psychologist found in her studies of the girl inmates in the English Prison.

94. *"Medical Aspects of Old Age."* Sir Humphrey Rolleston. This is a resume of a small volume originally published some 10 years ago; 200 pages of good reading.

95. *"The Great Experiment."* Edith Horn. The biological introduction to the problem of sex and parenthood for young people in the puzzled stage.

96. *"The Black Death and Men of Healing."* Anna Montgomery Campbell. Story of the plague which afflicted European learning and scholarship in many ways.

97. *"Fads and Quackery in Healing."* Morris Fishbein, M.D. Another smasher of pseudo-scientific healing cults and health and beauty racketeers.

98. *"Prohibitory Minds and the Present Social and Economic Crisis."* Stewart Paton, M.D. A competent analysis of the emotional disorders that lead men to the desire to prohibit and to control the actions of others.

99. *"Can you Trust Your Daughter?"* Madeline Seymour. A girl who thought she was level-headed. A doctor who was a decade ahead of the moral standard.

100. *"History of Medicine."* Fielding Garrison. The best single volume in the English language. Every doctor should have a copy.

Goal for Industrial Hygiene

BY DEAN K. BRUNDAGE
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DURING the last few years while the tide of employment has been ebbing, this country appears to have experienced the lowest death rates in its history. This anomaly raises the question as to what extent occupational health and accident hazards affect the mortality rate for the country as a whole. Perhaps declining industrial activity, if not too prolonged, may affect mortality favorably. Or, expressed conversely, it may be that greater activity in industrial and commercial pursuits involves hazards that are reflected in higher mortality rates and possibly in greater frequency of serious sickness.

What we need for ascertaining the answer to this question is an index of the health of those who earn a living in such pursuits in comparison with a similar index for persons not engaged in industrial and commercial occupations. Unfortunately, no such index is available; it is necessary, therefore, to resort to less direct methods for obtaining information which may shed light on the question.

Mortality of Males as Compared with Females

ONE such substitute method is to compare the health of males with that of females. The majority of women still work at home, although a large number of them, especially in recent years, have gone into outside pursuits. However, the distinction holds good that the working environment of the woman is the home, and of the man, the factory, store, or office.

Is there any difference in the health of males as compared with females? Let us take the rate of mortality as our first indicator even though such an index of health is, admittedly, a crude one. In comparing the mortality of the two sexes we must bear in mind that the vitality of the female is greater than the male at every age in life. The vitality of the female foetus, of the female infant, and of the female in childhood is greater than the male. But the widest difference in the death rates of the two sexes occurs between the ages of 40 and 65. The significance of the lower female death rates at these later ages has been regarded by some as evidence of stronger vitality, by others as an indication of her ability to conserve vitality the more. Speculation as to the causes of the more favorable female mortality at these ages may be avoided by finding out what diseases accounted for the higher death rate among the males. The rates for specific diseases by sex and according to age were computed for the period 1910-1920, and again for the years 1925-1929. In each of these two periods it was found that three or four causes of death accounted for the difference in the mortality of the two sexes. The cause of death showing the greatest excess of male over female mortality at ages 45 to 65 was accidents, many of which, of course, were of industrial origin. The second largest difference was due to tuberculosis of the lungs, the third to pneumonia, and the fourth to suicide. These causes afford no definite proof of greater conservation of vitality on the part of the female. In the absence of any definite evidence that the male lung is inferior to the female lung, it seems reasonable to conclude that environment, including working conditions, probably played an important role in the higher death rate from tuberculosis of the lungs among males at ages 45 to 65, especially since we know that tuberculosis reflects environmental factors in a peculiarly sensitive way. As regards pneumonia, which exhibited the third largest difference in the mortality of the two sexes at the later ages, we have definite evidence that a large number of occupations (and they are the ones in which males only can be employed) involve work and working conditions which definitely predispose to pneumonia. A recent study by the U. S. Public Health Service of the frequency of pneumonia among men exposed to extreme heat and sudden changes in temperature throws light on the causes of the higher death rate from pneumonia among males.

The fourth item, suicide, occurs about three times as often among males as among females at the ages under consideration. The fact that the percentage increase in suicides during the last few years has been greater among men than among women suggests that an important cause may be the heavier financial responsibilities of men with the pressure of financial difficulties affecting them the more. Fortunately, men are not so easily upset mentally and emotionally as women. The frequency of neurasthenia, nervous breakdown, and the like is about five times as great among industrially employed women as among men in industry. If, in general, women had as great finan-

cial responsibilities as men, the suicide rate would probably be even higher than it is.

Thus, when we take a crude index of health, such as the mortality rates of the two sexes, we find the differences of such a nature as to indicate that in the population as a whole, wage-earning involves greater risks of death than home-making. Even at the child-bearing ages the male death rate is greater than the female. It seems, therefore, that the scope of industrial medicine should be broad enough to permit effective attack upon these four important causes of the differential mortality of the two sexes at middle age.

Incidence of Sickness

ANOTHER index of the health of male as compared with female adults is available. For a number of years a group of industrial sick-benefit associations has sent to the U. S. Public Health Service periodic reports of the cases of disabling sickness occurring among its members for the purpose of affording a current index of the health of sample groups of the industrial population of the country. What does that record show in regard to the health of the two sexes? One finds, in general, that the frequency of sickness causing disability for more than one week is higher among industrially employed females than among occupied males; but for certain diseases the male rate is much higher than the female rate. It has not been possible to obtain sickness rates of the males adjusted to allow for the younger age distribution of the female employees; hence only wide differences in the frequency of disabling sickness according to sex have been considered.

There are several groups of diseases which occur among male industrial workers at more than twice their frequency among female employees. Among these groups are: pneumonia (all forms); rheumatism (acute and chronic); diseases of the organs of locomotion (lumbago, bursitis, etc.); and diseases of the veins, especially varicose veins. The breakdown of the veins, and the high rate for varicose veins may be due to the greater amount of standing usually required of males in factory occupations. The higher rate of rheumatism and of pathological conditions of the muscle among men appears to be associated with certain kinds of industrial exposure, for one finds startling excess of this type of illness among miners, and among men who work out-of-doors all the time. Pneumonia shows up in the sickness and in the mortality record as definitely in excess of the female rates.

Other Health Hazards

IN THOSE FACTORIES in which records of sickness are maintained either by the plant medical department or by the mutual benefit association, knowledge of the occurrence of sickness in excess of the average rate can be obtained for different occupational groups. Such information sometimes reveals the existence of health hazards that were hitherto not suspected. For example, in a tin plate mill in which there was considerable exposure to very high temperatures and to the risk of sudden chilling, the plant physician was unaware of the existence of a pneumonia problem until an analysis of the plant's sickness records disclosed the fact that during the five years ending in 1931, pneumonia had occurred in the group exposed to heat at more than three times the average rate for this disease.

One may expect from two to three case of pneumonia per year per 1,000 male industrial workers; in the group exposed to high temperatures in the tin plate mill the rate was 10.2 The last-named rate was based on the experience of 2,224 men over a five-year period (11,120 years of life under observation,) among whom 113 cases of pneumonia occurred.

A difficulty which the individual plant or company formerly experienced when analyzing its sickness records was lack of information concerning the average or expected frequency of specific diseases among industrial workers. This information may now be obtained, however, from the reports of average sickness incidence among industrial employees presented from time to time in the public health reports. Comparison with these averages has revealed an extraordinary frequency of certain diseases or groups of diseases in a number of industrial establishments. In several the rate of neurasthenia or nervous breakdown among female operatives was found to be abnormally high; in others, respiratory diseases as a whole occurred at excessive incidence; in still others the rheumatic group of diseases was outstanding.

When the sickness problems of industrial groups are known, a basis is afforded for the developing methods of prevention which should either minimize or entirely eliminate the effect of adverse working conditions.

The sickness data under discussion were obtained from modern, well-organized industrial establishments in which health and sanitation are probably given more consideration than in the average factory. Yet certain diseases occurred among the men in these establishments at rates sufficiently in excess of those for the women as to indicate that occupational factors probably were involved.

Until the male rates for pneumonia, tuberculosis, chronic rheumatism, and certain other diseases have been reduced to levels approximating the female rates, especially in the age group 40 to 65, it seems apparent that further study should go on of methods of preventing the male excess morbidity and mortality.

Vocational Rehabilitation

—History and Scope of the National Program—

by

JOHN A. KRATZ
Chief, Vocational Rehabilitation
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THE IDEA that many physically disabled persons, both young and old, could be completely or measurably restored in their bodily functions, and through training be prepared to take their places in the ranks of the employed, has been of slow growth.

It seems a far call from the time when the Spartans left their physically weak and disabled on the mountainside to die, to the present day with its laws, local, state and national, and its many private organizations for the alleviation of the ills of the physically disabled.

There still exists an astonishing amount of ignorance, prejudice, and indifference relative to the obligation of society to the disabled.

Vocational rehabilitation as a governmental undertaking has been made possible only after years of private effort in lines more or less parallel. Charity organization societies which originated in England somewhat earlier were introduced into the United States in 1877. With the development of these societies there began the first scientific case work in this country. "They had as their aim the avoidance of duplication the procurement of relief and other treatment strictly on a basis of need, and the restoration of the dependent to independence wherever possible."

The charity organization societies, now more often known as family welfare associations, have in some instances in the last 40 years developed special bureaus for the placement of the handicapped. The training or retraining of injured persons was left for another agency to be established later.

At a period somewhat later than the beginning of the charity organization societies in the United States the crippled-children movement began. Its primary aim was the physical reconstruction and education of physically disabled children.

ALONG WITH the movement for the restoration of physically disabled children through orthopedic surgery and therapy, and in some instances even earlier, public education was provided for certain types of handicapped children;—for the deaf in 1820; for the blind in 1830; for the feeble-minded in 1850; for cripples in 1890; and for the defective in speech and the tuberculous in 1900.

The development of scientific case work under the social service societies, the movement for the physical restoration of crippled children and the growing interest of the public schools in providing specialized training for physically disabled children, while they had only an indirect bearing on vocational rehabilitation, served to focus attention on the problem.

Another movement which had a more direct bearing on vocational rehabilitation was the enactment of laws for workmen's compensation for industrial accidents. As large industrial organizations came into being, equipped with modern machinery and employing men in great numbers, industrial accidents increased tremendously. Out of this condition grew the so-called safety movement for the prevention of accidents. The value of this agency cannot be overestimated, but in spite of every effort to safeguard machinery and to protect the workmen, accidents continued in large numbers.

There gradually developed the realization that employers and communities are responsible for the physical welfare of their employees and citizens. This led to the passage of workmen's compensation laws, the first of which was passed in 1911. At the present time there are only three or four states which do not protect their employed citizens through such a law.

WORKMEN'S COMPENSATION laws serve a three-fold purpose. They help to diminish accidents, they make provision for prompt medical, surgical and hospital care, and they provide for disability payment to injured workmen. Compensation officials were quick to realize that while these awards for the injured served a great purpose there was still a need for a "means for reeducation of injured workmen and their restoration to industry."

To meet this situation Massachusetts took the lead when, on May 28, 1918, the governor of the state approved an act providing for the training of persons whose capacity to earn a living had been destroyed or

impaired by industrial accident. It will be noted here that the state was still thinking in terms of the industrially disabled.

By the year 1920, 12 states had passed acts providing for the vocational rehabilitation of the disabled, in most cases rehabilitation of the industrially disabled.

In 1920 the National Congress passed an act for the promotion of rehabilitation of persons disabled in industry or otherwise and their return to civil employment. The word "otherwise" has been interpreted to apply to all persons who are vocationally handicapped by reason of a physical defect or infirmity whether congenital or acquired by accident, injury, or disease.

Thus, the idea which was gradually taking shape, to the effect that if it were sound vocationally to rehabilitate the industrial worker it would be sound to undertake the rehabilitation of other disabled citizens, had crystallized into law.

The National Civilian Vocational Rehabilitation Act of 1920 set up a Federal and States relation service. By accepting the provisions of the Federal act a state is given financial aid from the Federal government and also receives the benefits of a service of research and general promotion. The act establishes the principle that the nation as a whole should share with the states the common responsibility for vocationally rehabilitating the physically disabled, but that the direct responsibility for carrying on the work should rest with the states.

At the present time all but four states—Vermont, Delaware, Kansas, and Washington—have established vocational rehabilitation programs.

Under the terms of the National Act, the administration of the work so far as it relates to Federal activities is placed under the Federal Board for Vocational Education, and in so far as it relates to the work in the states under the State Boards for Vocational Education.

BEFORE TURNING attention to the methods of rehabilitation it may be of interest to indicate something of the size of the undertaking. For the year 1928 the National Safety Council reported for the country 24,000 fatalities in industrial accidents, 135,000 workers permanently disabled by industrial accidents; 72,000 fatalities by public accident, 144,000 persons permanently disabled in public accidents. Combining these figures we find that there were 96,000 persons killed and 279,000 who suffered permanent disabilities from industrial and public accidents in that year. Fortunately, not all persons receiving permanent disabilities are vocationally handicapped. To illustrate, a telegrapher might receive a crushing injury to his right leg which would constitute a permanent disability, but once his leg was healed he could return to his job. State agents for vocational rehabilitation estimate that one out of six permanently disabled persons should have some form of vocational rehabilitation service. One-sixth of 279,000 is 46,500, the latter figure being the estimated number of persons disabled through industrial and public accidents who were in need of some form of vocational rehabilitation in 1928. Add to this group those persons disabled by disease and congenital causes, the tuberculous, the hard of hearing, the cardiacs and the victims of infantile paralysis, to mention only a few of the major groups of those disabled by disease, and you realize that it is conservative to estimate that annually in the United States there are 55,000 persons with physical handicaps who would profit by a service of vocational rehabilitation.

THUS FAR the discussion for the most part has considered physically disabled persons and the agencies which serve them as such. Vocational rehabilitation is a specialized service of advisement, placement, and supervision, leading to the establishment of vocationally handicapped persons in remunerative occupations. The idea that a person with a permanent physical disability must also be handicapped vocationally to be eligible for the service of rehabilitation is important. Thus the major objective of the National and State Rehabilitation Service is the establishment or reestablishment of the physically vocationally disabled in such forms of productive employment as are followed by physically normal persons in making a livelihood. Two phrases embodied in the national and state acts stand out; first, the rendering of a physically disabled person fit to engage in a remunerative occupation; second, the return of disabled persons to employment. As the program has developed throughout the country, both by definition and process, vocational rehabilitation is considered in contradistinction to the physical, mental, social, or other forms of rehabilitation. The preparing of physically handicapped persons for employment and their placement in employment is primarily an economic undertaking and only secondarily social and humanitarian.

How are the steps in the vocational rehabilitation program accomplished? Very few disabled persons come to the attention of the Rehabilitation Service through their own initiative. Usually they are referred to the department by some interested agency. In order that these references may be made, the Service must aggressively develop and promote contacts and relations that will provide sources of cases. Reports of cases come from compensation agencies, public health departments, public school officials, social agencies,

hospitals, individuals, and disabled persons themselves.

From this point the program is fairly uniform in all the states. As soon as a case is reported, it is necessary to make a sufficiently detailed survey on which to establish eligibility and susceptibility for the rehabilitation and on which to determine the character and extent of the service to be rendered. With the facts at hand as developed by the survey, a service of counsel and advisement is given for the purpose of directing the disabled person's interest toward that vocation for which, in the light of his resources, he appears best fitted. Counsel and advisement is conceived to be a continuous process in the carrying out of the rehabilitation program, but at this point it is restricted to the consideration of a job objective, that is the occupation into which the person is to be ultimately placed. In order that this job objective, which has been agreed upon, may be obtained, a plan of rehabilitation is made, the execution of which fits the disabled person for employment. The carrying out of this plan is most important for it has as its end result the placement of the person in employment. After placement a service of definite organized supervision is continued until there is reasonable assurance of permanent satisfactory employment. These, then, are the technical steps in carrying out the process of rehabilitation—the survey, counsel and advisement, determination of job objective, preparation and execution of rehabilitation plan, placement in employment, and supervision to determine that the placement has been successful.

DR. RILEY M. LITTLE, Chief of the Bureau of Rehabilitation of New York, has stated the matter more graphically in the following paragraph:

"The rehabilitation service is not group work, nor can it be successfully accomplished by the usual standards of school work. Physically handicapped persons do not fit well into standards for normal pupils. Experience shows that the rehabilitation of the disabled is a highly complex, specialized, personal service, which must take form according to the peculiar difficulties and aptitude of each person. For one, it may be of assistance to secure physical reconstruction and a prosthetic appliance that he may return to his former occupation or engage in a new one. For another, it may be changing from unfavorable working conditions to a more favorable environment. To another, counsel and advice may be given about entering upon a business venture. Many industrial workers must be retrained in industry, others can take correspondence courses in their homes and be guided by tutors. Many can be sent to trade and technical schools for special courses, particularly the young. A small proportion can be retrained in commercial schools. Every physically handicapped person presents a number of distinct problems which the rehabilitation workers must deal with sympathetically and with imagination, patience, and ingenuity. Case work methods, therefore, are fundamental to success in rehabilitation."

Under the law the National and State Rehabilitation Service cannot relinquish its responsibility for any of the steps in the rehabilitation program from the initiation of a case to final placement in a remunerative occupation, but it may and does in many instances delegate certain parts of the program to a properly qualified cooperating agency. As a matter of fact there are certain services germane to any rehabilitation program which organized social and welfare agencies are better qualified to perform than is the State Rehabilitation Service. Furthermore, these agencies are in a position to render many essential services which under the law cannot be financed by the government agency.

Among the services that may be provided by cooperating agencies are the following: reporting cases, surveying cases, and making social diagnoses, securing financial aid, medical care and employment, improving morale of the disabled person, family rehabilitation, influencing sentiment and developing public opinion in favor of rehabilitation, urging persons to accept the service, and advising regarding requirements of the various vocations, and supervising cases after placement.

Experience in the work has proven that while vocational rehabilitation is a complex service adapted to the circumstances of each individual case, it is usually accomplished through one or some combination of the following methods: (1) Physical restoration; (2) Prostheses; (3) Establishment in business; (4) Placement; (5) Training.

THE METHOD of rehabilitation as applied to the individual case should be apparent from the records on the survey. If the person is in need of physical restoration this must be arranged for through an outside agency, since the Rehabilitation Service is not authorized to expend money on physical rehabilitation. Social service agencies, public health departments, hospitals, and private individuals are frequently turned to in such cases.

If the person under consideration has suffered the amputation of a member, consideration must be given to the furnishing of an artificial appliance. Under the law an artificial appliance may be furnished if it is needed in the process of rehabilitation. Primarily, the rehabilitation service does not regard itself as an artificial appliance-giving agency. In many states the compensation commission is authorized to furnish

artificial appliances to injured workmen and frequently employers furnish appliances to workmen who have lost limbs in the process of their employment. Thus the rehabilitation service is frequently relieved of considerable financial burden. Under compensation laws injured workmen may be paid their compensation in a lump sum if it is in the interest of justice. Wherever this award is made for the purpose of establishing a person in business, the Rehabilitation Service should be called in to cooperate with the Compensation Commission, for small business ventures are hazardous at best, and the person being established will need all the training and supervision which the Rehabilitation Division can render.

Some cases, dependent upon age, attitude, schooling, and other personal factors, are not susceptible for formal training. The best rehabilitation service for them is direct placement in some job in which the physical handicap will not prove a vocational handicap. The disabled person should be so placed that his adjustment is permanent in character and comparable to that of able bodied persons in the same vocation. While this placement is the direct responsibility of the Vocational Rehabilitation Service, assistance is frequently secured from a cooperating agency.

The last method of effecting vocational rehabilitation is through formal training. Frequently a man is skilled only in the field of work in which he was injured and to which he cannot return. In these cases training is necessary if the person is to be made economically independent. Depending upon the kind of work for which the person is to be prepared, his capacity for formal training, and available training facilities in the community, training may be given by tutors, in organized schools, on the job, or in commercial and industrial establishments. In general, if the man is under 25 years of age, without dependents, and has a common school education, institutional training is feasible. If, however, he is over 25 years old, has dependents, and has little schooling, employment training or learning on the job is more feasible.

Frequently it is necessary to combine two or more of the five methods just given in order to successfully rehabilitate a disabled person. In addition to training, a person may need physical restoration and an appliance in order to be fitted for an occupation.

THE RESULTS of the program usually are of more interest than its methods of execution. The national program of vocational rehabilitation has been in operation for a period of 12 years. The service has been definitely established in all but four of the states. The experiences of these cooperating states have completely justified the initiation of and participation in the movement by the Federal government. The social and economic significance of restoring disabled persons to productive employment is apparent.

The Rehabilitation Act became effective on June 2, 1920, and its provisions have been subsequently extended by Congress for three periods. It is significant that the last extension was enacted by the first session of the 72nd Congress for a period of four years from July 1, 1933, to June 30, 1937, at a time of economic stress, when the first order of governmental business was to curtail expenditures.

Notwithstanding the depressed condition of business, the number of rehabilitations in the country in 1931 increased over the preceding year by 13%, and again in 1932, when the reverse might naturally have been expected, rehabilitations increased by 9% over the preceding year.

While there is a great need to extend a wider range of services to a larger group of the handicapped, it may be positively stated that the feasibility of retraining and reestablishing physically handicapped persons in remunerative employment has been definitely established.

RECOGNITION should be given to the many cooperating agencies, local, state and national, who have aided materially in the advancement of the program. Outstanding in this group are the orthopedic surgeons who have given their time and skill to restore physically handicapped persons to the maximum of their physical powers in the light of their physical resources which remained after the accident.

It is a cardinal principle of vocational rehabilitation that no training should be given around a physical disability which can be removed, and in the carrying out of this principle the utmost cooperation has been obtained from the surgeons of the country.

Animal Experimentation

ACCORDING to an official statement by representatives of the Medical Society of the County of New York in conjunction with a meeting of the New York Academy of Medicine, animal experimentation is necessary for the ultimate solution of the cancer problem, and those who stand in the way of this essential humanitarian project should be considered as enemies to civilization. The old idea of the so-called toxic action of cancer has been thoroughly exploded, and the concept that a serum test can be properly adapted is also thought to be unscientific. It is also stated on good authority that excess alkaline substances in the blood do not provide the way to the development of cancer; it is equally true that acid intoxication so-called is due to other things than the cancer process itself.

Our Problem Page

—IV. Cadmium Poisoning—

THIS is the fourth of a series of articles in which important problems of industrial medicine and hygiene will be discussed. In the form to be used, the problem in its essentials will be briefly stated, and the discussion will follow. Suggestions from readers will be welcome and given due consideration in the selection of future subjects.

PROBLEM: We have cadmium poisoning hazard in our plant. Will you please give information as to the type of exposure, occupations and processes where there is a cadmium hazard and also symptoms and clinical findings, as well as some information regarding prevention and control?

DISCUSSION: According to Dr. Leon Prodan, who has done special work on cadmium poisoning, the following procedures or processes are believed to result in hazardous exposures:

(1) Vapor or fume from the retorts or condensors of the blue powder furnaces, in making both cadmium and cadmium oxide;

(2) Fumes from and near the collecting bags in making cadmium oxide; the particles which constitute this fume are so small that a large percentage of them are not caught in the bags;

(3) Dust in handling cadmium oxide, as such, especially in emptying the bags and packing;

(4) Fume from working up the blue powder furnace residues at the furnace and in the bag room;

(5) Shaking the bags in the bag room (blue powder) at the zinc-smelting kiln;

(6) Emptying the blue powder from the bags of the zinc-smelting kilns, storing it, and transferring it to the blue powder furnace or for the wet treatment;

(7) Working up the blue powder by the wet method—that is in handling the blue powder and the solutions with high concentrations of cadmium;

(8) Handling the metal residues stored for drying;

(9) Manufacturing and handling lithopone and working up the residues from this process;

(10) Manufacturing and handling cadmium sulphide;

(11) Spraying cadmium sulphide (as a paint);

(12) Welding alloys containing cadmium or cadmium-coated articles;

(13) Smelting metallic cadmium or its compounds without adequate ventilaton;

(14) Handling any cadmium compounds which may be inhaled or ingested;

(15) Using cadmium-coated or plated articles for any purpose where they may come in contact with food or drink.

The chief sources, therefore, of exposure are processes in which cadmium fumes are evolved, or where

Different kinds of cadmium salts produce a difference in the clinical findings and symptoms. Cadmium oxide produces an increase in the rate of breathing, in the amount of saliva, and the loss of appetite. Pneumonia very frequently results from cadmium oxide fumes or dust, as do degenerative changes in the liver and kidneys.

Cadmium sulphide may cause vomiting, diarrhea, an occasional increase in the amount of saliva, an increased rate of breathing which is very often labored. This substance may also cause a generalized pneumonia and a bronco-pneumonia, but the lungs are quite often the only organs affected.

It is well to remember that cadmium salts and compounds of various types are very likely to contain impurities in the form of lead, iron, and sometimes arsenic. Both lead and arsenic poisoning are, therefore, possibilities where a finely divided fume or dust of impure cadmium is generated in manufacturing.

VARIOUS INVESTIGATORS have held that cadmium causes a definite inflammation of the mucous membrane of the gastro-intestinal tract, emaciation and loss of weight, and fatty degeneration of the heart and kidneys. Several European scientists have said that the sulphate, the carbonate, and the oxide of cadmium cause diminution of the hemoglobin and red cells of the blood; a diminution of certain types of white cells known as the polymorphonuclears, and an increase of the lymphocytes. An irritation of the conjunctiva of the eye and the mucous membrane of the respiratory passages has also been observed.

However, these observations were made previous to the excellent studies of Prodan previously referred to and it is quite likely that the observations of this investigator are now more generally accepted than the ideas formerly held.

The number of cases reported in the literature is not large, but there have been some fatal cases recorded. Sir Thomas Legge, the British industrial hygienist, reported a fatal case of poisoning by cadmium fumes in 1923. This was caused by the melting of cadmium ingots in a crucible heated by gas and not connected with a ventilation pipe. The two workers assisting this engineer became seriously ill but recovered. Symptoms complained of by these men were dryness of the throat, headache, rapid pulse, nausea, brown color of the urine, and shivering. The autopsy

findings in this case showed signs of congestion in the larynx, the trachea, and the bronchial tubes; acute inflammation of the stomach and intestines; fatty degeneration of the heart and liver; and hemorrhagic inflammation of the spleen and kidneys.

Prevention

PREVENTION depends upon the type of process involved, in which cadmium fumes are generated. Where cadmium plating is done, prevention may be accomplished by the use of specially designed exhaust ventilation systems, which are similar to those used in clearing the air of chromium vapors in the process of chrome plating.

For other processes, according to Prodan, an air-mask or respirator is the best method of protection for exposed workmen. The respirator is recommended where the percentage of cadmium contained in the material handled is small; a soda-lined cartridge should be attached to the respirator when acid fume is also present in the breathing atmosphere. The mask should be used in all cases where the cadmium content is high. Adequate ventilation is the most important consideration in the prevention of poisoning.

Summary

CADMIUM and its compounds are now more widely used in industry than ever before and there has been a greater interest in cadmium poisoning for the past five years, due to this extended use.

2. Although the number of cases reported in the literature is relatively small, it is likely that this number does not represent the actual number of cases of poisoning in industry.

3. Cadmium may cause serious consequences and even death, where proper precautions are not taken.

4. Protection consists mainly in affording adequate exhaust ventilation and supplementing this procedure by the use of properly designed and efficient respirators and masks, when necessary. The responsibility of the employer lies in providing this type of protection for exposed workmen.

5. It is important that the employer should know when a cadmium poisoning hazard exists in his manufacturing processes, and make the proper provisions for the protection of his workmen.

Health Education

THOSE INTERESTED in the subject of health education can learn much from advertising promoters who look at the public as a dynamic being possessed of momentum, continuous though varying, from birth to death.

Advertisers show interest in the individual as such and not merely in his disease, which amounts to a technic in motivating the individual. "A variety of so-called antiseptics have been sold to the public to the extent of millions of dollars, simply because the advertisers know that no man would willingly offend the nostrils of his neighbor."

Health educators must be familiar with man's fundamental needs and desires. Man is curious. Let us stimulate his curiosity and feed it with salutary knowledge. Man has the instincts of combat and appeal, of submission and assertion, of inquisitiveness, constructiveness, laughter. There is the parental instinct, and a great need for food, for sex, and there is the driving force of self-preservation.

But man is not natively perverse, any more than he is natively noble. He merely is. Within him are resident a given set of potentials that are subject to manipulation by those skilled in the art.

It is this realization I hold basic to any appreciation of the psychophysics of health education. It is in this appreciation and in the knowledge of man's dynamic nature, of the trends of his individual growth, of the motives behind his behavior, that we shall find the secret for motivating human action along desirable ends.—*Colorado Medicine*, March, 1933.

Mental Effects

ACCORDING to the *Mental Hygiene Bulletin* for September, 1932, mental hygienists encounter two reactions to the depression:

1. The depression is an opportunity if it becomes sufficiently disrupting to compel men to think as they never have before, to compel them to plan for the rebuilding of our civilization along lines that will take into account man's physical, mental and spiritual needs.

2. The second reaction is one of consternation, of fear, almost of despair. In this connection there has been evidence of a concentration of attention upon the maiming effects of the economic catastrophe upon those whom it has hit the hardest.

Apparently this is a good time to test our remedial and preventive machinery, to re-orient our health, social and educational movements. The conservative wants to turn back to the "good old times;" the modern sophist is for tearing down the whole structure; the social planner says, "Let's analyze our social organization, conserve what is pertinent and helpful to our needs, and build anew in terms of present day realities;" the individualist says, Lets us not worry about society—let us merely rear well-adjusted, clear thinking individuals;" and finally, the philosopher replies, "That is not enough; we must also alter the structure of society and redirect its development so as to make it possible for the individual to function adequately."
—Abstr., *Colorado Medicine*.

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EDITORIAL

"Traumatic Neurosis"

THE "TRAUMATIC NEUROSIS" has been a disturbing element to physicians, executives, lawyers, insurance companies, and even to employees, as long as the expression has been known. In spite of attempts at rationalization, the condition has not ceased to be a complex difficulty, taxing the ingenuity of the best informed and the most intelligent. Clarity of conception, therefore, is essential.

Dr. Jewett V. Reed has thus stated the case: (p. 157): "The kind and degree of psychic disturbance is not in any way dependent upon the nature of the trauma, but it depends upon two other groups of factors: (1) the circumstances under which the trauma occurred, and (2) the mental make-up of the patient himself and his attitude toward his environment."

Difficulties always arise when cause and effect are confused—as Dr. Reed puts it: "In this type of abnormal psychic process associated with an injury the essential mental process is not a neurosis, but it is a mistake on the part of the patient in confusing cause and effect. The first manifestation of disease showing itself coincident or following an injury is the most frequent cause for controversy in compensation cases and personal injury claims. In such cases, the patient may be perfectly honest in his belief that the injury either caused or aggravated his illness. In olden times almost every disease or bodily abnormality was considered to be due to malicious or evil influences or to abnormal physical surroundings. Almost every type of injury was believed to be able to cause almost every kind of disease and these superstitions of folklore persist today in many of our most enlightened patients. Almost every ill person tries to figure out in his own mind the cause for his illness, and as most persons suffer occasional injuries of more or less severity, it is very easy in the absence of actual knowledge of the true nature of the disease to blame the disease on the accident. This is not only seen in those trying to obtain damages, but also it is almost universal. In most cases the lack of connection between the injury and the disease can be satisfactorily explained to the patient, but when there is the opportunity to capitalize a coincidence in a damage or compensation suit, it is very difficult or even impossible to show the discrepancy between the alleged cause and the effect. The patient and his attorney want to believe it, and as a rule it is not hard to find a physician who can devise a fantastic explanation of the connection which may appear plausible to the laity."

The remedy is simple in principle, "The only solution in handling these patients who are deluded reing cause and effect is to explain to them in detail the physical reasons for their mistaken ideas. * * * If one keeps in mind the fact that almost every injury causes some mental deviation from the normal, and if while treating the physical injury the physician notes these abnormal mental attitudes, he may be better able to diagnose the cause of a neurosis if it should later develop."

The application of these concepts should go far toward supplying the basis for the adequate handling of the puzzling "traumatic neurosis."

Physical Defects

SOME industrial physicians believe that the follow-up and correction of physical defects occupy a place next in importance to entrance physical examinations, even superseding in importance the use of periodic health examinations.

In the July issue of *Industrial Medicine* (p. 98), Dr. Rufus B. Crain has outlined a plan which has admirably served the purpose intended in a large organization; it should be possible to adapt these principles in other groups with equal salutary effects.

Dr. Crain describes the follow-up examination in these words: "Such an examination is confined, as a rule, to single or multiple conditions discovered at a previous general physical examination, such as the preemployment examination. It, in a measure, provides a substitute for an annual periodic health examination when the latter is not possible or considered necessary. It is applied to cases where the physician feels there is urgency for action. The seriousness of the impairment and the intelligence and cooperative-

ness of the employee determine the interval between such check-ups."

Within recent years the prevalence of the predominating types of physical defects has been studied and analyzed by several groups, notably the Life Extension Institute and the Milbank Memorial Fund. Such data covering thousands of individuals provide a standard basis for comparison with the figures obtainable in any specific industry.

A definite and scientific classification of physical defects has never been accomplished, although several attempts have been made. Neither has the exact relationship of defects to the incidence of sickness, accidents, and absenteeism been established. It is believed that health habits are in some way related to physical defects, but no scientific knowledge is available on this subject.

These are all problems that are important in industrial medicine and attention should be given to their solution in the future. In the meantime efforts can well be focused on the recording, follow-up and correction of defects in employees of all industrial organization.

Through the study of such records, a proper approach to these problems can be secured.

Back Injuries

INDUSTRIAL BACK INJURIES have long been the stumbing block of the surgeons, claims departments, attorneys, and industrial commissions, as a comparison of experiences readily shows. The economic involvement of these types of injury may well run into millions of dollars annually.

Goldwaite quoted by Ellis (p. 152) brings new light to the subject in the observation that "the skill required for operative work (orthopedic) is much less than that required for diagnosis in the many non-operative cases with the planning of the appropriate treatment. Back cases, as usually seen, are uninteresting, because the average surgeon does not understand them. Once understood, they become interesting, and intelligently treated, cease to be the burden of the clinic."

Diagnosis then being the chief point at issue, it is well to consider some of the impending difficulties As Ellis mentions. "the amount of loss of function in the injured back can no more be assayed by x-ray examination than can this type of examination be relied upon to diagnose the commonest type of traumatic knee disability, injury of the internal semilunar cartilage or the frequent cause of intractably painful shoulder which results from rupture of the supraspinatus tendon." Of great importance, however, are the history of occurrence of trauma; the general examination; and the special examination of the back itself.

This does not mean that x-ray evidence is of no value—as in other diagnostic precedures it is supplementary to the evidence gained by clinical examination.

Another real difficulty that has frequently baffled the surgeon in arriving at a diagnosis, is that of determining the existance of pain; as many surgeons have said, "you really have to take the patient's word for the fact that he has pain." On this point Ellis aptly remarks: "the examination of the 'compensable back' is made tremendously more difficult by the fact that, with the exception of the objective evidence elicited by expert manipulation (expert passive motion for diagnostic purposes), the physical signs that we find are those produced by spasm, traction and rigidity of the muscles moving the joints, rather than signs produced by the painful joints themselves. But it is these problems of differentiation that we must attack."

Reliable diagnostic tests are most frequently based upon ability to perform certain definite functions—this principle applies no less in instances of back trauma although inspection and palpation are not to be omitted in a diagnostic procedure, and continually to be used in conjunction with performance tests.

Inspection, palpation and manipulation should give valuable diagnostic information in different positions, as the essayist has well noted.

A most valuable criterion is the muscular behavior of the patient before, during and after he has assumed the various positions used in the diagnostic manipulations.

Although these tests probably have not yet been widely enough used to be accepted generally by most surgeons, a detailed study of these methods and careful and scientific observation during their use should yield information which will materially aid in a more accurate measure of disability in many puzzling cases of the "compensable back."

Size Frequency of Industrial Dusts

THE QUESTION of particulate size of industrial dust is one of great importance in considering the mechanism of pulmonary pathology resulting from dust inhalation in various occupations. The subject has received much discussion and is quite likely destined to be a subject of future research and concern among investigators in this field.

Recently (U. S. P. H. S. Public Health Report 48: Aug. 11, 1933) Bloomfield has made a comparison of the size frequency of outdoor and indoor dusts, showing in a series of observations that the median diameter of outdoor dusts was 0.5 micron, the majority of the particles being under 1 micron, while industrial dusts measured for the most part between 1 and 3 microns, the median being 1.5 microns. From these

and other facts, it is contended that in conducting dust studies, our chief concern should be about particles ranging in size from 0.5 to 5 microns.

The South African investigators, Moir, Watkins-Pitchford, and Mavrogordato have observed that the majority of dust particles recovered in pathological specimens of both human and animal silicotic lungs measured between 1 and 3 microns in greatest diameter. It is significant that only 13% of these particles were found to be less than 0.5 microns. These findings have recently been checked by Scheid in Germany, and Drinker in comparing the size frequency of particles measured by Moir, working in the sputum of men employed in ore mills, found a close correspondence in size.

Two questions naturally arise: to what extent are minute particles of dust retained by human lungs, and do appreciable percentages of industrial dusts occur in sizes less than 0.5 micron?

The answer to these questions seems to be found in the work of Drinker and Brown who showed that the coarses suspensions in air were retained more effectively than finely divided fumes and that the percentage retention was directly proportional to particulate size and to the destiny of the dust suspended in the air. Furthermore Owens working in London, found that only 25% of inhaled dust was retained, the average size in these experiments being about 0.5 micron. These studies therefore, together with the present study seem to bear out the idea that dust particles of a size less than 0.5 micron play but a small role in the problem of industrial dust inhalation; Bloomfield's study has shown as noted above that the majority of industrial dusts range between 1 and 3 microns, the median being 1.5 microns.

The question of proper methods of sampling and counting also occurs. Recently, Hatch, as quoted by Bloomfield, found that the modified impinger developed by Hatch showed an efficiency of more than 98% at a normal sampling rate of one cubic foot per minute, when a silica dust suspension of approximately 1.5 microns average diameter was used. Even when using finely divided magnesium oxide fumes formed by burning a magnesium ribbon, the instrument showed an efficiency of 55%.

Using the U. S. Public Health Service standard technique of counting which has been presented in detail in various publications, a study showed that an experienced observer is capable of seeing quartz dust particles as small as 0.7 micron. In the size frequency study reported by Bloomfield, 15% of the dust in industrial air is less than 0.7 microns; the reasoning is that the present method of counting is capable of disclosing therefore about 85% of the dust particles collected by the apparatus. It is claimed that the simplicity of the method, the practical applicability of it, and the fact that the counts may be checked by trained observers, offsets the disadvantage of the 15% of the smallest particles, which according to various observers, as far as our present knowledge goes, play no important part in pathology.

As Bloomfield remarks: "the best criterion of the value of any method of measurement is its successful use and practical application. Such a test was offered in the study of the health of the workers exposed to the inhalation of granite dust (made by the U. S. Public Health Service at Barre, Vt.). In this study it was definitely established that a high correlation existed between the intensity of exposure to dust and the degree of silicosis and active tuberculosis. It is obvious, therefore, that the technique of dust analysis that we have been using constitutes a valuable index of the hazardness of dust inhalation."

It would, therefore appear that until further and more enlightening observations are made by pathologists in identifying the smaller size of dust particles in pathological specimens, improved methods in collecting and sampling, as well as counting the smaller order of particles, these standards should be accepted as workable and tenable.

New Evidence on the Non-Toxicity of Zinc

IT WAS FORMERLY THOUGHT that the inhalation of zinc and zinc compounds caused a definite poisonous reaction, but it is now known that zinc is not a poison in the usual sense of the word. Although certain zinc compounds such as zinc chloride, are highly irritative and caustic, having this common property with a number of other chemical substances, it is now thought that pure zinc in contrast to such metals as arsenic, lead, antimony, and cadmium, has no poisonous qualities even if taken in large amounts. It is also believed that zinc oxide or zinc stearate because of their fine state of division or tendency to flocculation may do harm but not on account of zinc content.

Because of these ideas which are different from prevailing opinions, Drinker and Fairhall (U. S. P. H. S. Public Health Report: 48, August 11, 1933) have thought it well to redefine the hygienic position of zinc from the aspect of the relation of zinc and zinc compounds to the health of the general public and a similar relationship to the health of workers engaged in the manufacture of these types of compounds.

Regarding the amount of zinc occurring in drinking water, after finding a considerable variation from the formerly accepted standard of five parts of zinc per million parts of water, Bartow and Weigle have concluded that the possible effect of other impurities

has not been considered (such as cadimium and arsenic, which is sometimes present in zinc used for galvanizing). These investigators believe, therefore that pure zinc salts in reasonable amounts of drinking water are not harmful and that since pure zinc is difficultly soluble and can now be made cheaply there is a possibility that the solvent action of waters on galvanized iron pipes could be reduced by using pure zinc for galvanization processes.

Because zinc occurs in varying amounts in all types of plant and animal life and in considerable amounts in many different types of foods, experiments were made on volunteers regarding the ingestion and excretion of zinc and zinc compounds. In brief, these experiments showed that a zinc excretion measuring 48 mgs. a day makes obvious that the mere fact of zinc ingestion is of no great importance.

Nevertheless it must not be forgotten that practically all of the readily soluble salts of zinc are irritating or even caustic, but the more strongly acting compounds are not likely to contaminate food.

Relative to the exposure of employees to zinc compounds, Drinker and others have had opportunity to make observations on the so-called "zinc chills." The findings lead these observers to believe that these symptoms are due to contamination by other substances, since this type of metal fume fever has been produced by inhaling finely divided particles of magnesium oxide and other metals.

These facts should be of great importance not only to the general public, but also to those industries, and they are many, making continued and extensive use of zinc and its compounds.

This New Deal

THE AIR is full of different opinions and speculations as to the form and the results of plans for national industrial recovery. Without question the health of industrial employees will be a very important item in these plans; health in this instance refers not only to physical efficiency, but also to mental health, especially in regard to the use of the leisure time which present plans will probably increase for each person. In this connection, some observers have suggested the importance of adult health education and recreation programs.

Certain specific problems present themselves. According to Dr. Hart E. Fisher (see p. 166) "By their enforced vacations away from the rules and regulations and out of the industrial environment, these applicants will have lost their old spirit of caution, not to say their ideas of discipline; all the practices and safety training that have taken years of education to instill into the average man and woman have suffered by severance from industry. The accident severity and frequency rate will increase greatly with reemployment, as the returning workers will be anxious to show their ability, and the desire to please will induce haste which is very apt to precipitate an accident. If good times return with a boom, then things being speeded up will see a large increase of accidents. * * * Should industries be lax in supervising the medical policies of the employees, they will with a very short time experience an ever-increasing rate of absenteeism from work on account of illness, which carries with it economic loss both to employee and employer. The same holds good for the rate of labor turnover in industry. Every change of workman in an industry can be figured as a loss and, too, with each new employee we assume an unknown liability so far as safety in operation is concerned. Your old employee is a known value and his education in your company means the past outlay of many dollars to make him a safe and efficient worker. Keep him in the family by all means. Where physical defects predominate in employee personnel, one finds change of occupation frequently due to defective physical conditions. * * * When industrial activity begins, the reaction to this overwork in the employed person will be as great as the reaction experienced by those who were formerly idle. I believe that the reaction will be greater to those who have been carrying on during the past years with their increased burdens because they have had no relaxation from their mental and physical effort, while the unemployed worker has had at least the opportunity of relaxation of physical body as well as mental state. The employed man's worries and fears have been constant and, under stress of employment responsibility, added efforts are prone to cause mental and physical breakdowns when the reaction sets in after business improvement."

Such conditions call for a rigid program of health supervision and should include thorough entrance examinations with a follow-up and correction of physical defects. Some organizations are now also planning periodic examinations where known occupational risks exist, a careful periodic inspection of plant conditions inducing health hazards, and an exit examination in each instance of severance of relationship.

It is safe to conclude that adequate knowledge of the physical and mental status of employees, with properly kept records, will play a prominent part in the upbuilding of industrial and commercial pursuits, and that such procedures will be of greater importance in recovery than can now be visualized—especially since "the provision according employers full privilege to hire, fire or promote employees according to their merit" is included *only* in the automotive industry code, and is not likely to be included in any others.

Industrial Medicine Digest

Rating Disabilities

DR. EARL D. McBRIDE, *in Journal of The Oklahoma State Medical Association* (March, 1933): — This is a detailed dissertation regarding a method of determining the percentage of permanent disability for the Oklahoma State Industrial Court. Numerous tabulations are used regarding the comparative value of parts of the arm, or the leg, and of mutiple disabilities.

The functional factors pertaining to the ability of an individual to use his limbs and body in ordinary manual labor at a normal wage-earning capacity is summarized as follows: (1) quickness of action: (2) coordination of movement; (3) strength; (4) security; (5) endurance; (6) safety, and (7) ability to secure employment.

All of these factors are discussed separately and the functional factors of loss are mentioned as: (1) delayed action, slowed up motions; (2) awkwardness and clumsiness in grasping pushing and holding; weakness and lifting power and muscular action; (4) insecurity and instability in holding or pushing or pulling power; (5) diminished endurance, vigor and vitality; (6) lowered safety and protective ability; and (7) interference with chances for securing employment.

The relative value of these functions is rated at 10% except numbers 3, 4, and 7, which are given 20% each, the total making 100%.

This paper forms a very definite basis for the rating of disabilities.

Treatment of Flat Feet By Corrective Exercises

DR. J. C. ELSOM, *in Clinical Medicine and Surgery* (March, 1933): —The anatomy of the foot and the weight-bearing points are considered in a detailed discussion.

The diagnosis of flat feet is particularly aided by the recording of permanent foot-prints; temporary foot-prints may be made by wetting the foot and stepping on the floor, but permanent prints are valuable and a method of recording such prints with the formulae for the various solutions used and the technique carried out, is described.

The classification of flat foot, according to Cotton is: (1) habitual or reducible, which comprises a majority of the cases, due largely to muscular weakness, especially of the tibialis posticus, flexor longus hallucis and flexor longus digitorum; (2) rigid, or spastic, which is generally connected with spastic conditions due to a variety of pathologic nervous causes; in this group pain is a prominent symptom; and (3) bony flat foot, in which there is more or less bony displacements and inequalities, and in which orthopedic operation may be necessary.

The corrective exercises are described as follows:

1. Correct gait is a prime consideration. The proper position of the feet in walking is the maintenance of a parallel position of the feet. They should never be turned outward; one should walk with the feet pointed straight forward.

2. When the toes are turned inward, a corrective position is established. The so-called "pigeon-toed" gait should be consciously practiced for a considerable period each day. A strong exercise of this nature is the following: — in the standing position the toes should be sharply turned inward, with the heels well separated. From this position the patient should rise sharply on the toes from 20 to 50 times or more.

3. The feet are placed parallel; the patient throws his weight on the outer borders of the feet and assumes the varus position. This exercise should be repeated slowly until some fatigue is felt. Walking a few steps on the outer sides of the feet may likewise be practiced. A similar exercise, but more moderate, is taken while the patient is seated. The legs are outstretched; the patient attempts, by strong muscular action, to place the soles of the feet together. This of course cannot be done, but the attempt brings into play the muscles which strengthen the arch.

4. Considerable relief is afforded, in painful pes planus, by crossing the feet while seated, thus the varus position is assumed passively.

5. In the recumbent position, the knees should be extended alternately, as in the pedalling position on a bicycle, making large circles in the air with the pushing with the heels on the upward motion, with sharp plantar flexion on the downward motion.

6. One should stand with the toes over the edge of a low, flat stool, bench or similar support, and forcibly exercise the toes in plantar flexion. A similar exercise may be done by walking barefoot, or with light shoes with flexible soles, along the rungs of a ladder placed on the floor. The toes should be turned inward somewhat and should grip the rungs of the ladder with each step. Two ladders may be used, placed side by side and elevated in the middle by some support. This forms an angle like the roof of a house. The angle, however, should not be too sharp (above 150°). This is a splendid corrective movement, but must not be used until the muscles have become strong enough to do the exercise without causing pain.

7. A simpler exercise consists in walking along an imaginary line, the right foot stepping over the left side of the line, and the left foot stepping over the right side of the line.

Exercises such as the above should be begun mildly and continued with rigid regularity for weeks or months. Many cases of pes planus are materially benefited by such exercises, but they should be used in conjunction with the usual orthopedic measures.

Fractures of the Os Calcis

DR. GEORGE P. MYERS, *in International Journal of Medicine and Surgery* (February, 1933):—Fractures of the os calcis have been a source of difficulty for many railroad claim departments. Painful disability following such fractures is a common occurrence, the usual complaint being that they can walk for short distances with little pain, but that any irregularity in the surface may twist the ankle in such a way as to cause severe pain and substantially temporarily completely disable the patient. The ordinary treatment by diathermy, massage, passive motion, exercises, corrective shoes, and caliper splints has been very disappointing.

Some years ago the author began the practice of short immobilization in casts, the cast being applied from the toes to the midleg and in the case of unilateral fractures, the patient was given crutches in the beginning and urged to walk and to begin bearing weight as soon as it was possible to do so. At the end of three weeks the cast was removed and the

normal use of the foot was encouraged. The same procedure was followed in the case of bilateral fractures, except the patient was kept in a wheel chair and urged to exercise his legs and move his toes as much as the cast permitted; when the casts were removed, the patient was given crutches and urged to walk. By these methods great improvement was obtained as compared with those in former vogue.

A number of such experiences gradually led to the discarding of all dressings in the impacted fractures of the os calcis. It has been discovered that impactions become quite firm in a short time, so much so that efforts to break impactions on various occasions by manual methods have failed.

There is a factor of safety in the treatment of such fractures without dressings, and that is the inherent unwillingness of all human beings to punish themselves; pain, then, is a very effectual check on activities that may do harm, and treatment, therefore, consists, when the fragments are in a satisfactory position, of putting the patient to bed for a few days with the injured foot on a pillow. From the start the patient is given crutches and urged to use them; twice a day the foot is given a ten-minute bath in hot water, followed by very gentle massage and passive movements within pain limits. Active movements are also encouraged and at the end of a week, the patient is discharged from the hospital and continues the treatment at home. Weight bearing is begun as soon as possible and some light work which can be done sitting down is also of benefit. The same procedure is used in bilateral fractures, except that we cannot expect the patient to use crutches at the outset with both feet crippled. A great deal of encouragement is necessary although we occasionally find one patient who seems to be overbold and requires a word of caution.

The author summarizes his experience as follows: (1) Painful disability has been a frequent sequel of os calcis fracture, not necessarily of the severe complicated type but of the more common impacted fracture without marked bony malformation; (2) such disability responds poorly to usual methods of treatment; (3) we believe that this disability is not generally due to structural changes in the foot produced by the fracture itself, but is the result of changes induced by prolonged immobilization and non-use of the foot; (4) impaction in os calcis fractures is sufficient to hold the fragments in the impacted position, which is usually good, and the impaction rapidly becomes firm enough to withstand considerable strain, (5) the check on movement produced by pain restrains patients from making motions which might cause harm; (6) in the case of ordinary impacted fractures it is recommended that no immobilization be used. Treatment consists of a few days' rest in bed and physiotherapy. The patients are given crutches at the outset in unilateral fractures and as early as possible in bilateral. (7) No specific method of treatment is recommended for complicated fractures, each being individually treated as the occasion requires. Immobilization periods should not be longer than three weeks. Effort should be made to get the patient on his feet as soon as possible; and (8) these methods have yielded very satisfactory results.

Estimation of Permanent Disability in Industrial Accidents

DR. HENRY H. KESSLER *in The West Virginia Medical Journal:*

—In most compensation schedules there is no provision for the determination of how reduced earning capacity should be measured, following industrial injuries. For the most part, however, the extent of bodily injury is used as the indicator of reduced earning capacity. Theoretically this is not accurate, because it is not the lesion which is to be indemnified, but the effects upon the ability of the man to work and earn money.

Besides these difficulties the schedules for rating present only an approximation of the reduced earning capacity which is further modified by the fact that for the most part, such schedules are a compromise between capital and labor as to what should constitute a fair basis of indemnification.

Perhaps the ideal way would be to take a thousand machinists between the ages of 25 and 35, having the same lesions (such as an amputation of the hand) make observations over a definite period of time, for instance five years. One could then come to a fairly definite conclusion concerning the earning capacity of these one thousand machinists, as far as economic effects of a hand amputation are concerned.

Since such a procedure is not possible, one must compromise by using an adaption of the schedules of private insurance companies which have existed over a long period of time and which have been modified for the particular purpose of rating permanent disability.

The discrepancies existing in the various state laws are productive of great difficulties. For instance, in Alabama, an arm that is amputated at the shoulder is worth 200 weeks of compensation, while in Hawaii it is worth 312 weeks; in New Mexico it is rated at 150 weeks.

There is also a relative inaccuracy in the schedules—in Alabama an arm or hand is equivalent to 27% of the total industrial efficiency, while in Hawaii it is given a 78% value.

Further complications are encountered because the laws only include ratings in regard to the extremities of the human body; nothing is said about back injuries, injuries of the genito-urinary system, abdominal injuries or injuries to other parts of the body or vital organs. In a number of instances a few so-called absolute incapacities, such as total paralysis, burns or insanity are included.

The laws contain no guiding principles relating to the determination of partial disabilities—those less than 100%

The physician is, therefore, invested with the tremendous task of making determinations of partial disabilities without any guidance of provisions in the schedules; of rating disabilities provided for in the laws; and of translating into mathematical terms various and complicated deformities and disabilities without any guiding principles.

Various criteria come into the minds of physicians when making an estimation of disability — one may think of the reduction of earning capacity — another of the effect of the injury on the loss of efficiency for a specific vocation — in terms of structural loss of the part—or as a serious handicap to the obtaining of employment. The question which is always before the physician in going over any case is which of these criteria shall be chosen and which shall be the most important and whether more than one shall be used.

The author believes that functional loss (physiological loss) lends itself most readily to measurement and in giving information concerned in determining the disability in terms of reduced earning capacity. Function is defined in this instance as being composed of motion, strength, and coordination.

The measurement of these elements is the next consideration. For the determination of motion, goniometers, arthrometers, hinged protractors and compound protractors are used to determine the range of motion of the

joints. Comparisons are made with reference to the joints of the uninjured side of the body. For determining strength one can use an ordinary spring dynamometer, but according to the author this is a very inefficient and inaccurate instrument. Therefore, the spring balance of Martin and Lovett has been used and found to be very effective. A very valuable aid is the tabulation made by Martin showing a series of relative strengths of the various muscle groups of the upper extremities; if properly done, the readings should conform very closely to these percentages.

In the measurement of coordination, there are a number of psychological tests that have been successfully used—the target test is a simple one—another one is the peg-hole test. There are a number of these that can be adapted for this use.

The actual technique of the estimation of these components may be briefly described. Equal value is given to the three major joints of the arm, the shoulder, the elbow and wrist, assigning each a value of 33⅓%. In a fracture of the upper end of the humerus when the arm will only come up 90° instead of the elevation of 108°, there is a loss of 50% of one arc of movement — meaning a loss of 50% of 33⅓% in this instance which is 17% of motion in that range. There may be losses of motion in other directions, such as external rotation and internal rotation, but the range of motion which is limited to the largest extent is taken as an index of the limited range of motion for the entire joint; for example, if there was a reduction of 50% of forward flexion — 15% in extension 10% in external rotation—the 50% loss would be used as an index for the total loss of motion in the shoulder. The computation would then be 50% of 33⅓% or 17%. The strength of the arm radical would then be tested with a spring balance and coordination would be estimated with the peg-hole test.

The next procedure would be an examination of the hand radical; the function of the hand may be compared to a pair of pliers and a hook. The hand also acts as a pair of forceps, through the ability of the thumb to touch the tips of each finger. These mechanical motions may be grouped into three essential functions, namely, the grasping power for small objects between the folds of the fingers; the grasping power for large objects between the fingers and the palm; and the apposition between the thumb and the tips of the fingers.

An equal value is ascribed to the above three functions. If a patient loses any of these functions, he has lost one-third of his ability to use his hand properly, although the function of apposition is slightly more important than the other two. Arbitrarily, however, the larger disability is taken as the disability of the hand radical.

Rehabilitation forms a very important part of getting injured persons back to work. The author has had experience with a workshop where men with injuries other than those of the extremities come in for a period of observation and perform manual work. There is a carpenter shop, a printing shop, show-card writing shop, a loom-making group, and other types of occupations. Injured men are graduated through various types of work which finally permits them to take up in a number of instances, gainful occupations, similar to those which they formerly held.

In conclusion, this type of work, namely the rating of disabilities, and rehabilitation, is only in its infancy. There are many changes necessary, and there are great possibilities for improvement in the guiding principles which can be used in the important work of estimating and following up industrial disabilities.

Treatment of Burns With Gentian Violet

DRS. J. H. CONNELL, T. J. FATHERREE, C. B. KENNEDY, AND G. H. McSWAIN, *in Journal of the American Medical Association* (April 22, 1933): — Aldrich has suggested treatment of burns with a 1% aqueous solution of gentian violet. The authors have made an attempt to improve the technique of the use of this dye.

In a series of 15 treated cases, each patient having a first, second or third degree burn covering from 5 to 35% of the surface of the body, 10 cases were treated by the method of Aldrich, the remaining five were treated by the improved method which the authors describe, as follows: the dye is incorporated into a jellylike base, adding 30 grams of tragacanth to 1000 cc. of a 1% aqueous solution of gentian violet; a thick layer of this jelly is placed on four or five sheets of gauze and applied to the burned area. Repeated applications were not necessary except in severe cases. A thin, moist, sterile protective layer was formed over the burned area and rapid healing resulted.

Although the number of cases is small, the conclusions reached are that the treatment of burns with gentian violet, as first suggested by Aldrich, gives excellent end results and from this experience it is believed that gentian violet jelly is superior to the aqueous solution of the dye.

Industrial Eye Examinations

DR. M. DAVIDSON, *in The Sight-Saving Review* (March, 1933):— With the expansion of motor vehicle driving and the increased use of aviation, as well as other means of transportation, defective vision as the cause of accidents is not to be over-looked. There are also certain eye diseases which are important in industrial organizations. Industrial efficiency can also be increased by the proper care of the eyes of employess.

Other important points are the medicolegal implications and the bearing of the condition of the eyes on il lhealth and fatigue.

The standardization of visual requirements has been recommended by the Committee of the Thirteenth International Congress of Ophthalmology held in 1929 and these have been summarized in a tabulation by the author. The various factors are form sense (visual acuity); orientation sense (indirect vision); light sense; color sense; and sense of depth (binocular single vision).

As an example of the requirements for certain occupations, the following are mentioned: near vision is required by fine mechanics, printers garment workers and office workers; distant vision is required mainly by transport workers; both types of vision are required by those who deal with moving objects or who have to move around stationary objects; depth perception is required by artists, draftsmen, etc.; color vision is required by embroiderers, signal men, chemists; light sense is required by sailors, chauffeurs, miners, night watchmen, etc.

There is considerable confusion caused by the great variation in statistics relating to the prevalence of defective vision in industry. Some studies show from 10.6% to 95% of people with defective vision, depending upon age and occupation. Another study shows 46% of all rejections were because of defective vision; still another study shows 22.8% of defective vision from all causes among industrial workers, but only 6% with monocular blindness from

all causes, and only 2.2% due to errors of refraction. The author in discussing this subject says: "If we bear in mind that many of these had better or normal vision in the other eye, the probability is that 4% to 6% is the maximum that comes under the most rigidly applied definition of defective vision among adults. This is borne out by our study of 1000 compensation cases, which contain as many as 47.1% of injured eyes with sequels, and many more without sequels and 24% awards for permanent eye injuries. This shows only 20.2% of persons with vision of 20/40 and less in one eye, if we discount stimulants and enucleated eyes. The fact, however, that, with exception of 0.2% of bilateral industrial blindness, all are returned eventually to industry, is the most eloquent argument against popular misconception of the magnitude of the problem. As to the effect of defective vision on accidents to eyes, it must be small, since eye injuries are predominantly from "flying" particles or liquids which good vision alone cannot control."

In plants employing over 5,000 persons and where eye accidents occur in sufficient number, there should be an ophthalmologist and the periodic eye examination should be entrusted to him as part of his duties. Smaller plants should engage part-time eye men. It is the belief of the author that under any circumstances, eye examinations should not be the work of anybody but eye specialists; such specialists cost no more to employ than optometrists, and they can do the work of treating and examination, as well as discovering the many general diseases, such as diabetes, nephritis and central nervous system disturbances, which eye examinations disclose.

The following summary is given in this important paper: (1) The arguments for eye examination of industrial employees are derived from four fundamentally different motives; safety; medicolegal problems in workmen's compensation; industrial selection; and vocational guidance. The first two arguments are in the domain of public concern and public health—the last two are in the interest of industry and of the worker respectively. (2) Contrary to prevalent conceptions, the problems involved concern only about 4% to 6% of the working population, and the term "defective visions," as applied to them, is too broad. It should be specific as to the different elements in vision—visual acuity, color vision, light sense, indirect vision and depth perception, and their varying importance from the different angles of approach. (3) The main problems are safety and compensation for eye injuries. The former is partly solved by the state-controlled examination of all transport employees; by railway, marine, aviation and motor vehicle licensing provisions; and its standards are being now established by an international congress. There should be a preemployment examination by state agencies for both purposes, at intervals of three to five years. (4) For industrial selection, vocational guidance and elimination of occupational diseases, a different procedure in standardization, on the basis of the special requirements for types of occupation, should be worked out, and should be the task of annual periodic eye examinations by plant medical services. (5) Eye examinations for the purposes mentioned should be the work of ophthalmologists, or "eye physicians," exclusively.

Methylene Blue Solutions in the Treatment of Carbon Monoxide Poisoning

DR. J. C. GEIGER, *in The Journal of The American Medical Association* (April 8, 1933):—The use of methylene blue solution in the treatment of cases of carbon monoxide poisoning has received a great deal of comment in the press and in scientific publications.

This paper reports two cases in San Francisco in which methylene blue was used and in which recoveries took place.

It is stated that one cannot positively affirm that the cause of the condition in these instances was carbon monoxide, although, even in the absence of laboratory data, the first case was probably due to this gas. In the second case, however, since natural gas is almost entirely free from carbon monoxide, the question arose as to whether it was a pure case of "oxygen want" due to the presence of natural gas from a leaking appliance or an unlighted portion of the burner.

The author's comments and conclusions are: the mechanism through which the dye acts is one that has not been entirely or adequately explained. All workers seem to agree that it involves the oxidation-reduction processes, but all are agreed, apparently, also, that these processes are probably quite complex and that other effects, such as stimulation of the respiratory, circulatory and heat regulatory centers, likewise enter into the complete explanation. Hanzlik suggests also that the dye might be useful in hemorrhage and shock but that the effects would probably be fleeting in character, and the comparatively large amounts of the dye in the quantities of fluid necessary in such cases might produce deleterious results, since the dye itself possesses a certain degree of toxicity.

Methylene blue, and possibly dyes other than methylene blue, might be found useful in treating conditions other than cyanide poisoning in which the oxidation mechanisms are depressed or inhibited and the effects are apt to be permanent rather than fleeting, as they are in hemorrhage, shock, carbon monoxide poisoning, and other comparable situations. "Even in diabetes mellitus in which the tissues may be at fault in their inability to properly oxidize sugar, it is conceivable that a dye which would satisfactorily promote oxidation (and not at the same time be toxic when used over relatively long periods or time) might be of some value."

The use of methylene blue (methylthionine chloride, U.S.P. medicinal) in the treatment of cyanide or carbon monoxide poisoning is still in the experimental stages. Its use in the four cases cited, shows promise, but the need for more accurate observation and more complete data is obvious.

Air Conditioning, Comfort, Health and Efficiency

DR. EMERY R. HAYHURST, *in The Journal of Industrial Hygiene* (March, 1933):—This is an unusual study reviewing the personal experiences and presenting conclusions in air conditioning of common interiors for comfort, health and efficiency. The paper stresses the value of simple procedures which have been experienced in a private home, and in school buildings in Ohio, having different systems of heating and ventilating, both old and modern. Observations were continued over a period of 10 years with especial attention to the outside weather, and the inside ventilating factors, as well as to the cost of heating.

The author's summary states that satisfactory air conditioning of a home in Columbus, Ohio, over a studied period of 10 years is described — the winter seasons being especially in mind. The residence is a slate-roofed, 2¾ story brick structure of 10 rooms, third floor dormitory and basement. The basement, first and second floors, but not the dormitory, have been included in the study. The air volume of the experimental quarters is approximately 20,000

cubic feet. The interior is on the open plan, including basement. The recirculation plan is utilized, with several vents for the escape of used air but none for the intake of air.

Heating is of dual form: (a) general, by gas furnace for a law comfort temperature average, and (b) local, by radiant gas heaters for quarters intended for sedentary comfort. Fuel economy is shown by costs for space heating which ranged from $71 and $108 per year (1923-1932). Natural gas of 1050-1100 b.t.u. per 1000 cubic feet, costing $.55 per 1000 cubic feet has been the fuel used. Insulation and heating are the only controlled factors. What little control has been necessary has been manual. Warm weather adjustments are partly met through roof insulation and more use of the basement part of the house. The experimental group consisted of a family of eight persons, made up of three adults and five children the latter ranging in age from eight to 19 years. All have dressed lightly and conformed to a rational diet. A careful record of all disabilities occurring in the experimental group has been kept for the 10 year period. These have been divided into the following classes: non-disabling respiratory, disabling respiratory, other non-disabling, and other disabling. Analysis of these disabilities, it is believed, shows a better than average health record. It tends to support the belief that the state of nutrition (resistance) and not "bad air" determines respiratory afflictions and their complications.

Calcium as an Antidote in Poisoning

DR. EDWARD PODOLSKY, *in Clinical Medicine and Surgery* (April, 1933):—The first experiment in finding an antidote for cocaine poisoning by Karl Mayer disclosed that calcium salts and cocaine have a reciprocal inhibiting action in regard to lipoids, especially suspensions of lecithin. This paved the way for further research on calcium therapy as an antidote for various types of poisoning.

The work of Mayer was followed by that of Fabry, as well as that of Underhill and Gross. The earlier investigators used calcium chloride, but at the present time calcium gluconate which does not possess the irritative properties of the chloride has found greater favor.

Lead poisoning is a condition which is very definitely associated with derangement of the calcium metabolism and the studies of Aub, Fairhall, Minot, and Reznikoff have demonstrated that a liberal calcium intake will store the lead in the bone, whereas the opposite condition will set the lead free in the blood stream.

Young, Taylor and Merritt have studied the use of calcium in the treatment of cases of mercurialism. These investigators suggest that the same principles utilized in the management of acute lead intoxication may be applied in the treatment of acute mercury poisoning.

Stokes, an authority on the treatment of syphilis, has stated that the detoxifying and irritation-reducing effects of calcium can be utilized just before the injection of arsphenamine and thereby the possible deleterious reaction be mitigated.

The conclusion reached is that calcium compounds are of value as an antidote in different types of poisoning.

The Accident-prone Worker

DR. C. L. FERGUSON, in *National Safety News* (March, 1933):—The accident-prone worker is a very important individual because he is responsible for the majority of accidents in any factory or community.

Various definitions have been given for the accident-prone worker, the one used by the Metropolitan Life Insurance Company being as follows: "Accident-prone workers are those individuals who because of certain mental, psychological or physical defects fail to control a situation leading to an accident."

The causes of accident-proneness may be grouped under three major headings: *physical factors, mental factors,* and *operating factors.* Among the specific causes are faulty attitude, failure to recognize potential hazards, faulty judgment of speed and distance, impulsiveness, irresponsibility, failing to keep attention constant, nervousness and fear, defective vision and hearing, organic diseases, slow reactions, senility, worry and depression, fatigue, improper distribution of attention, inexperience, and any other type which may be discovered in an investigation.

Obviously the accident-prone worker does not possess the proper type of physical and mental requirements to conduct his occupation without the occurrence of accidents.

To pass proper judgment on the accident-prone individual requires every bit of information that it is possible to gather. This may include reports from the foreman regarding the worker's mental attitude and his habits or methods of operating; a complete physical examination by the physician in charge; the visiting nurse may contribute information regarding home or financial circumstances, which may be deciding factors.

In studying the accident repeater, one should (1) observe him operate; (2) analyze present and past records; (3) have a personal interview; (4) decide on the primary cause; and (5) recommend treatment based on actual findings.

Dust Protection

PROF. PHILIP DRINKER, *in National Safety News* (March, 1933):—The control of the silicosis problem consists of two definite steps: (1) medical examinations of new employees and routine examinations of all persons exposed to dangerous dust concentrations; and (2) reduction of dust concentrations breathed by workers, to what are considered safe limits.

Such devices as respirators and positive-pressure helmets should be considered only as emergency equipment if dustiness can be controlled by dust-collecting equipment and exhaust fans. However, there are many processes in which respirators and other protective devices have an important place and probably will for many years to come.

The efficiency of respirators has been an open question; there are several kinds of respirators exceeding 90% efficiency on silica dust with particles less than two microns in diameter.

Respirator requirements and specifications have been formulated by the U. S. Bureau of Mines. Briefly, the requirements for approval state that a gas mask canister (which includes respirators) must have at least 50% filtering efficiency against tobacco smoke, measured at 85 liters per minute, a resistance at all times of less than four inches of water, and that the filter shall not plug readily thereby offering breathing resistance. A so-called "man-test" is also required, in which the respirator is required to give adequate protection to men performing light work in an atmosphere containing an irrespirable suspension of definite concentration. Tobacco smoke efficiencies are determined photometrically.

Six tests for respirators are outlined by the author, the details being given for each one. These are briefly comparison of impinger samples taken of filtered and unfiltered air, the procedure used being a standard dust counting method, a turbidimetric method or photometric method: the use of calcium carbonate of less than two microns particulate size;

use of burning yellow phosphorus; use of smoke made by burning various kinds of pipe tobacco; the measurement of resistance to airflow, which is made more exacting by the use of known amounts of magnesium oxide fumes; and the man test.

The technique is given for the measurement of the efficiency of sandblast helmets while in operation, measuring the relative dustiness of the air under these helmets. Paint spray masks are also tested by making samples of the air within the mask during the time of use.

The author concludes that the U. S. Bureau of Mines would be the logical place for the certification of respiratory devices; private testing laboratories could not be expected to undertake this type of work without charging the manufacturer a fee adequate to give the laboratory a reasonable profit.

Venereal Diseases as an Industrial Problem

DR. WALTER CLARKE, *in The Journal of Industrial Hygiene* (March, 1933):—It is stated that almost 1% of the population of the country at any given time is under medical care for syphilis or gonococcal infection.

Statistics in various industrial groups indicate that syphilis is a very heavy and serious burden; the incidence among railroad employees in a certain survey was 11.7%; among barbers 12%; among milk handlers 4%; food handlers and drivers of public conveyances, 3.7%; and coal miners 8.5%.

It is estimated that about $100,000,000 a year is spent on the treatment of syphilis and gonorrhea in the United States and on a conservative basis it has been figured that these diseases cost the wage earners of the country about $84,000,000 a year. This is in addition to the indirect costs which are equally burdensome.

The author advises the following procedures of control: (1) an adequate physical examination of every employee, repeated especially after absences due to illness, including a blood test for syphilis and a clinical and microscopic examination for gonorrhea. This matter may be handled in various ways, either by having all new employees have a blood test or including a blood test for syphilis in all reexaminations; or by having employees subjected to a medical examination once a year including a blood test.

The various ramifications of the venereal disease prevention program are discussed in detail.

The author concludes that syphilis and gonorrhea are prevalent diseases which result in serious direct and indirect losses to industry. Industrial leaders can reduce these losses by encouraging and introducing measures to prevent and treat syphilis and gonorrhea among their employees. As in the control of any communicable disease in any community, the early discovery of infected and infectious individuals is of prime importance. This is to be accomplished by appropriate medical examinations of personnel. Having discovered infected individuals it is essential to render them non-infectious and to arrest the progress of the disease. This is accomplished by treatment. As exposure to syphilis and gonorrhea is often at least partly a matter of volition, instruction as to the gravity of these diseases is to be given so that ignorant exposure may be avoided. Since the social environment influences exposure to infection, deleterious factors such as prostitution or sexual promiscuity should be reduced to a minimum and protective activities such as athletics and properly arranged supervised recreation are to be encouraged. Chemical prophylaxis should be available for those who, in spite of all warnings and deterrent influences, nevertheless expose themselves.

Effects of Certain Silicate Dusts

DR. WALDEMAR C. DREESSEN, *in The Journal of Industrial Hygiene* (March, 1933):—This is a study of a group of workers exposed to tremolite talc dust and red and green slate dusts.

The dusts were analyzed chemically in each instance as well as petrographically and it was found that there was no free silica in the form of quartz in the tremolite talc, the green slate containing only a trace and the red slate approximately 3%.

Dust count averages in various departments of slate and tremolite talc milling plants were taken.

Radiographic studies were made of the employees and these films were interpreted.

A great deal of attention was focused on the relation of years of exposure to the roentgenographic findings.

Comparisons were made between the average dust count given in million particles per cubic foot.

The author states in summary that the small number of individuals observed in the short duration of exposure for most of them invite caution as to deduction; two conclusions, however, seem to be justified: (1) the silicate dusts of tremolite talc and slate induce a fine, diffuse, bilateral fibrosis of the lungs which is definitely demonstrable in the x-ray; and (2) while very dusty conditions prevail in certain departments of these two stone trades (tremolite talc and slate) it cannot be said that the resultant pneumoconiosis has led to disability.

Tonsillectomy by Fractional Electrocoagulation

DR. GEORGE B. COLLIER *in New Orleans Medical and Surgical Journal* (*January*, 1933):—This paper is a discussion of the advantages and disadvantages of diathermy in otolaryngology. The author has never been able to find any method that is perfect or what may be called "foolproof"; because there is a growing interest among the laity in regard to this subject and numerous other things which the laity expect as impossible, it is felt that a frank discussion of the possibilities of the method of electrocoagulation should yield important information.

In addition to the use of diathermy for electrocoagulation of tonsils, it is also valuable for hypertrophied lingual tonsils and varicose veins at the base of the tongue; for the shrinking of enlarged turbinates in the nose of adults where breathing is difficult and where the septum is fairly straight; the removal of polyps from the nose; the removal of warts and nevi; and in malignancies of the mouth and antra.

The technique as described consists in an office procedure adminstered in a sitting position; 10% cocaine is applied to the tonsil and pillars and a small amount to the base of the tonsil where it joins the tongue—after two applications sufficient anesthesia is usually accomplished. A curved hooklike needle is used in applying the current, being careful to neither remove or insert needle when the current is on. Blanching occurs at each insertion to about twice the depth of the actual penetration. One should avoid touching the pillars because of the causing of intense pain, edema and consequent scar tissue.

It is the writer's custom to make about six punctures in one tonsil, wait a week and then treat the other tonsil similarly. After an interval of another week, second treatment is given to the first tonsil, by which time the coagulated tissue has sloughed away and one can determine how deep it is necessary to go for the second treatment. In like manner the second tonsil is treated and after another week only a small amount of tissue re-

mains and at this time the belly of the curved needle is merely laid on the remaining tissue to blanch it. Great care must be taken not to injure the tissue adjoining the tonsil and all tonsillar tissue must finally be removed.

Dr. Collier believes that the procedure requires more experience than an ordinary surgical enucleation.

In summarizing the disadvantages and advantages the following points are made:

"*Disadvantages*:

"1. Neither bloodless, painless nor simple but requires more skill and knowledge than ordinary surgical tonsillectomy.

"2. Unable to use on children.

"3. Secondary hemorrhage.

"4. Possibility of quackery.

"*Advantages*:

"1. Less chance of infection and bleeding, also useful in checking hemorrhage.

"2. Can be used when surgery is contraindicated.

"3. Certain cases because of horror of operation, or unable to secure time off, etc., are benefitted by this that would not submit to surgery and in this way some organic disturbances are prevented.

"4. Easy removal, at one sitting usually, of hypertrophied linguals and lingual varices.

"5. The proper technique and equipment brings success.

"6. The easy removal of remnants of lymphoid islands which at times appear in the fossa.

"7. I wish to reiterate that it is a valuable contribution to otolaryngology."

Ringworm of the Feet

DR. WM. J. YOUNG, *in Kentucky Medical Journal* (March, 1933):—Because ringworm of the feet is a very important industrial skin disease, and important among the general public at large, the author's comments are of especial interest.

Both preventive and treatment methods are reviewed in this article and especial stress being laid on preventive measures for athletic clubs and swimming pools.

Ultra-violet ray and x-ray radiation have both been used with success, the x-ray being more certain and constant. For local application some modification of Whitefield's Ointment is used; 5% chrysarobin in choloroform; á one to three thousand solution of potassium permanganate, scaling down to one to five hundred in certain instances; Burrow's Solution one to three parts; merchurochrome 10%; tincture of metaphen are made use of most frequently.

The author concludes that ringworm of the feet is the most prevalent skin disease in the south; that high content of sugar in perspiration seems to predispose to exacerbations; and that preventive measures are the most important and little regarded.

The Efficiency of Respirators

RUEL L. STRATTON, *in National Safety News* (February, 1933):—This work is the combination of several years' study relative to the protection of employees against inhalation of lead fumes and dust. The author describes and illustrates an apparatus for testing the efficiencies of various filtering media against the inhalation of lead dust and fumes. In testing 20 different types of filtering media, the filtering efficiency varied from 100% in certain kinds of felt to as low as 0% in flannel cloth and cheese cloth. Other materials which gave percentages in between were rice paper, various grades of felt, absorption cotton, plain and impregnated types of special cloth, cheese cloth and absorption cotton, wet and dry sponges, cheese cloth packing, and the so-called cartridge type of respirator filter.

The research involved (1) generation of fumes and dust; (2) a collection train to determine how much fume and

THE BULLETIN

of

The American Association of Industrial Physicians and Surgeons

VOLNEY S. CHENEY, M.D., Secretary
Armour & Co., Union Stock Yards, Chicago

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THE OBJECT of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

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VOL. 11 SEPTEMBER, 1933 No. 9

ANNUAL MEETING

THE MEMBERS of the New York State Society of Industrial Medicine will hold their annual meeting at the Hotel Seneca, Rochester, N. Y., Thursday, November 2, with a diversified scientific program of particular interest to industrial physicians and surgeons.

The morning session will be devoted to the presentation and discussion of a paper on "The Prostate as a Toxic Factor in Trauma" by Dr. Alexander Mason, Surgeon at General Hospital, Syracuse; discussion by Dr. John B. Stevens, Syracuse. "An Evaluation of the Three Different Types of Treatment of Osteomyelitis — Chemical Sterilization, the Orr Treatment and the Maggot Treatment" will be presented by Dr. Edward T. Wentworth, Rochester, with Dr. Richard S. Farr, Syracuse, leading the discussion.

Election of directors and officers for the coming year will precede the scientific session.

The New York State Society issues a cordial invitation to all who may be interested in these subjects. Sessions will start at 10:00 A. M. standard time.

dust was generated and put into the air stream; (3) a means for inserting the filtering medium in the air stream; and (4) the analysis of the amount of lead withheld and the amount passed by the filtering medium.

The results showed that the visible appearance of the filtering medium did not have any relationship to its efficiency. Microscopic examinations were made of all specimens of filtering media to ascertain the physical make-up of the material. Observations were also made by reflected light and in some instances by transmitted light. Micro photographs of various samples were made, these being easier to procure where a thinner filtering material was used. No consideration was given to the type of face-piece; the material used in the face-piece; the shape and method of fitting the face-piece; and whether or not exhale valves were provided. It must be recognized that all of these factors can affect the total efficiency of a respirator.

Neither was any account taken of the resistance to air flow. This is especially important since too high a resistance will make the respirator so uncomfortable that the worker will not wear it.

The conclusion reached was that in order to obtain a filtering efficiency greater than 75%, it is necessary to use a closely matted felt, a close-fibered filter paper or material of similar character.

Internal Derangement of the Knee Joint

DR. JACOB KULOWSKI, *in Journal of Iowa State Medical Society* (March, 1933):—In this very excellent paper Dr. Kulowski gives a review of semilunar cartilage injuries and loose bodies, definitions reviewing the history, and an outline for analysis including the anatomical the dynamic and the pathologic situations. A great deal of discussion is devoted to the x-ray examination and the differential diagnosis.

Some of the special lesions which are considered are osteochondritis dissecans; osteo-arthritic osteophytes; chondromalacia of the patella, and chronic synovitis.

The treatment is considered under several different headings, acute cartilage lesions; recurrent lesions of the semilunar cartilages; loose bodies, and treatment of other forms of derangement mentioned.

Case studies are reported in summary, giving statistical experience with the various types of pathology.

This is an excellent paper and should be filed for reference by any surgeon who is doing orthopedic work.

Estimation of Orthopedic Disability

DR. WALTER G. STERN, *in The Ohio State Medical Journal* (March, 1933):—There is a great deal of difficulty arising from the different schedules and bases for the estimation of disability in the different states.. It has been proposed by the International Association of Industrial Accident Boards and Commissions to have the amount of disability expressed not merely with the anatomic extent of the loss, but rather in percentages of permanent total disability which is interpreted as 100% of unfitness for future industrial usefulness.

In the estimation of permanent disability it is necessary to keep certain principles in mind: (1) compensation paid for permanent disability is that paid after temporary disability ceases—that is, for the loss of earning power after healing has taken place; (2) compensation for such permanent disability should be valued on disability for a lifetime; only 13 states allow this —others have a time or money limitation; (3) permanent disability should be based on a table of *fixed* ratings, modified by important variable factors among which may be mentioned age, the type of occupation, the will to work, the presence of pain, and pre-existing disease.

The author discusses in detail the type of occupation, the various influences of different age periods, the factors contained in the will to work, the differences in pain, and the influence of pre-existing disease.

An excellent outline is given of the mechanical characteristics of the upper extremity, including joints and bones. The same outline is given for the lower extremity.

Several tabulations are shown, one

showing the percentages of disability for permanent and partial disabilities at various ages, another on the loss of flexion motion, and another on the loss of motion of the knee.

The scheme herewith presented is an excellent one for the guidance of the orthopedist and the industrial surgeon who must estimate disability in terms of either permanent total, temporary total, permanent partial, or temporary partial.

Ownership of X-ray Films

EDITORIAL, *in The Ohio State Medical Journal* (March, 1933): —A decision has been handed down in Ohio by Municipal Judge I. H. Rohlfs holding that x-ray plates are the property of the person taking them, regardless of whether the patient has paid for the work or not. The court declared that he was "of the opinion that the protection of the person taking said films depends largely on the proper preservation of the same and such films should remain with said dental surgeon or physician," adding that "the interpretation is the all-important thing in connection with an x-ray examination, the film itself simply being the basis of the interpretation." This is a decision of exceedingly great importance to industry.

Central States Society of Industrial Medicine and Surgery

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The Industrial Commission and the Industrial Surgeon

By WILLIAM SCANLON

BEFORE THE DAYS of workmen's compensation laws, I believe that the term "industrial surgeon" was practically unknown. Some of the larger industrial plants maintained a first aid department, but that was all. The object was primarily humanitarian, yet it gave these companies the advantage of very useful information with regard to the nature and extent of the disability, etc., in the event of a damage suit for personal injuries. Generally speaking, an injured workman was obliged to seek medical treatment as best he could. In the larger cities, if the injury was serious, the employer called an ambulance and the man was taken to the hospital, and in many cases to the county or a charitable hospital.

With the advent of workmen's compensation, the duty of providing first aid, medical, surgical and hospital treatment was shifted to the employer. It was then that the industrial surgeon came to be known to the general public. In the beginning the amount of money for which an employer was liable on account of medical services was very limited. In some of the states it is still quite limited.

Under the Illinois Workmen's Compensation Act, effective in 1913, the maximum liability of an employer for necessary first aid, medical, surgical and hospital services was $200 in any one case, and the period of this liability was limited to eight weeks. This sum of $200 was adequate to cover the great mass of small injuries. It was a pittance when applied to the case of a man with a broken back or a badly fractured bone in the leg or arm that would not readily knit, and which required weary months in the hospital under the daily care of a physician. The payment of the physician's fee had been made certain where the injury was of a minor character and no complications ensued. For the more serious injury, the fee was protected up to the $200 maximum for medical and hospital services, but the physician could not, without violating the first principle of medical ethics, forsake a case which he had taken in charge and abandon a patient. The doctor was placed in the position of having to continue to render treatment, without much hope of ever being paid for his services.

In 1919, the Illinois legislature amended the Workmen's Compensation Act, by providing that the employer, in addition to the $200 maximum heretofore mentioned, was obligated to furnish all necessary hospital services required during the period for which compensation was payable and all medical and hospital services necessary during the time the injured man was confined to the hospital.

Another amendment, effective July 1, 1925, practically swept away all limitations and made it the duty of the employer to provide all necessary medical, surgical and hospital services reasonably required to cure or relieve from the effects of the injury. While this duty was placed upon the employer, it has always been and still is the law that the injured employee may select his own physician at his own expense.

Illinois has thus been one of the states foremost in broadening the provisions of the law with reference to providing adequate medical and hospital services, and in protecting to the fullest extent the interests of the physician and surgeon. He is now paid in practically every case. Formerly he was lucky if he got anything.

Five years ago I became a member of the Industrial Commission of Illinois. As the years go by, I have become more and more impressed with the vital and necessary part which the physician and surgeon plays in the successful administration of the Workmen's Compensation Law. His functions are two-fold. First, to render emergency treatment, set fractured bones, ward off infections, and do those other things necessary to obtain as good a surgical result as possible and to secure the return of the injured workman to the rank of industry as soon after the injury as reasonably possible. The second function is to give the Industrial Commission the benefit of his expert professional knowledge and experience to aid the Commission in determining whether there is any permanent disability resulting from the injury and if there is the extent of the same, when either or both of these questions are in dispute before the Commission

I am speaking now of only those injuries with which the Industrial Commission is concerned, those cases where the period of temporary total disability extends for more than six working days or whether there is some permanent disability for which compensation may be payable. Statistics show that of all industrial accidents, only about 60% are serious enough to be compensable. These accidents are reported to the Industrial Commission at the rate of about 5,000 each month. One-third of these

represent disability caused by contusions or abrasions. Cuts and lacerations represent about one-fifth. In one injury in every eight there is a bone fracture.

This means that physicians in Illinois are called upon to treat over 50,000 compensable accident cases each year. Some require drst aid, others require treatment over a period of many montns, sometimes years. Each year about 7,000 fractures must be taken care of, and there are about 1,500 amputations.

Testifying

WHEN an injured employee and his employer or the insurance carrier cannot agree as to the amount of compensation payable, or when a dispute arises concerning some other question relative to the injury, a claim may be filed with the Industrial Commission. The claim is then docketed and the matter set down for hearing at some convenient point in the vicinity where the accident occured, and an arbitrator is assigned by the Industrial Commission to hear the testimony and write an award. In almost all of these cases the question of the nature and extent of the injury and probable duration of disability are involved. In a vast number of cases those are the only questions. In cases of specific loss of a member, for instance, where the injury has resulted in the amputation of a thumb, then the determination as to the extent of disability is simple. The Workmen's Compensation Act provides that for the complete loss of a thumb the man shall receive compensation for a period of 70 weeks, in addition to his temporary total. However, when claim is made for an injury to the eye, or to the vertebrae or the sacroiliac joint, or to the deep structures of the body, then it must be backed up by the testimony of some person of special learning and qualifications, who is able to state what part of the anatomy is affected and the pathology involved and its relation to the disability claimed. Obviously the only person competent to give much testimony is the physician or surgeon who has attended the injured man, or some phyisician or surgeon who has made a proper physical examination. On the other side of the table, the employer or insurance carrier will put on a physician or surgeon who has also either treated or examined the claimant, to give his opinion on the subject of the nature and extent of disability and the causes thereof.

Thus it is that the industrial surgeon is frequently called upon to testify before the Industrial Commission. I believe most physicians and surgeons do so reluctantly. Many of them are too busy with their practice and find it irksome in the highest degree to sit around a court room waiting to be called to the witness stand, when they feel that they should be at the hospital performing an operation, or attending somebody who is in urgent need of medical care, or seeing patients at the office. I believe that the great function of the physician and surgeon is to treat and to heal. That must always be his first consideration. When an employee sustains a serious injury, he must have medical attention as quickly as possible and such medical attention must continue until his wounds are healed. Yet it is essential, in order that justice may be done, that in some of these cases the Industrial Commission, at some time or other, be told what the nature of the injury is, the kind of medical treatment given and the outcome of the case.

There are doctors who believe that to be compelled to testify in court is an affront to the dignity of the profession; that no self-respecting doctor of reputation will go on the witness stand and testify for anybody. This idea is erroneous.

The reputation of the industrial surgeon rests almost solely upon his professional skill and results obtained, and not upon his ability as a witness upon the witness stand.

There are other doctors who dislike to testify because an astute lawyer may on cross examination, by clever interrogation, attempt to belittle or distort the testimony. As he goes upon the witness stand he needs only bear in mind two considerations. First, that he should be fully prepared on the subject concerning which he is to give evidence. Second, that his demeanor should be that of an educated gentleman and suited to the occasion on which he appears. An honest, conscientious and properly informed physician or surgeon has nothing to fear from any lawyer at any time.

He should answer, in a simple, straight-forward manner, the questions asked of him. I cannot emphasize this point too strongly. The witness should listen carefully to each question asked, be certain he understands the question, and then in answering, frame his reply so that it will be a direct answer to the question asked. If the question can be answered by "yes," or "no," answer it by "yes," or "no." For instance if the question is, "Have you an opinion?" the answer should be "Yes," instead of going ahead and stating the opinion. What the opinion is, will be called for by the next question. As another illustration, an eye specialist was asked what the vision was in an eye. His answer should have been 20/40ths or 20/100ths, or whatever he found the visual acuity to be according to the Snellen Test chart. Instead, the doctor went into a technical explanation as to the various things which might have accounted for the lowered vision. As a result of his failure to make a direct answer to the question asked, the record became confused and the most important fact intended to be brought out by the testimony of this doctor was entirely lost sight of, namely, the actual vision in the eye. In nearly all cases the questions are asked by a lawyer and it is to be assumed that he knows at what goal he is driving.

Therefore, the medical witness should not interfere with the line of interrogation or volunteer information which has not been asked for, which will not help his testimony any and may result in embarrassing questions on cross examination.

It is important that a doctor should take the time to look up his record of the case concerning which he is to testify before appearing on the witness stand. It is even better to bring his case record with him. He cannot against objection, read it into the record as evidence, but he does have the right to refresh his memory from it as to dates, treatments, findings, etc. The testimony given is taken down by a stenographer and it is important that the data given be accurate, in order that a reviewing body or court, in reading the typewritten transcript, may not be misinformed. For instance, an employee may have sustained an injury on May 8, 1927. The doctor, through not having his record before him may refer to an examination as having been made on April 9, 1927, which was prior to the injury, whereas, the examination was actually made on May 9, 1927, the day after the injury. You can readily see how confusing this would be to a person reading the transcript of the testimony.

The Illinois Supreme Court has made a distinction between testimony which may be given by a physician who has treated a patient and that by a physician who has examined the patient merely for the purpose of testifying. For instance, an attending physician may testify as to the history given him by the patient, and the patient's statements as

to pain and suffering, etc., but such declarations "are only competent when made as part of the res gestae, or to a physician during treatment, or upon an examination prior to and without references to the bringing of an action to recover damages for the injury complained of," and that "the testimony of physicians is incompetent which is the result of an examination made with a view to testifying, and which is based wholly upon the physician's observation of outward manifestations within the patient's control." In other words, a physician who examines for the purpose of testifying is not permitted to testify concerning any subjective symptoms, which he has heard or observed, but can only testify concerning objective symptoms and report his findings and conclusions based on objective symptoms alone. I think you all understand pretty well the distinction between objective and subjective symptoms. I see no need of going into that subject any further.

A doctor should never, when testifying, state his opinion as to the percentage of loss of use of any member except where both sides agree that he may do so. That is, he should not state that a man has 40% loss of use of a foot or 75% loss of an arm.

It is the function of the Industrial Commission or its arbitrators to fix the exact percentage of loss of use of any such member, after hearing all the evidence. The physician should state his findings, not his conclusions. If it is an injury to the arm, the doctor may state the pathology he finds. He may state the degree of active flexion he finds, as compared with what would be normal flexion. He may do the same as to whether there is muscle atrophy or weakness, or whether he finds a nerve involvement or degeneration.

Lawyers sometimes raise technical objections to x-ray pictures offered in evidence. Many lawyers waive the technical proof necessary for the introduction of x-ray pictures required by the strict rules of evidence. If the doctor is known to the attorneys and is of high reputation, no question is ordinarily raised as to the admissibility of any x-rays from which he proposes to testify. On the other hand, strict proof may be required. On this point, our Supreme Court has said: "It must be established by competent evidence that the picture correctly portrays the condition it purports to represent. Some witness must be able to testify that the picture offered in evidence shows accurately what the witness saw when he looked into the body with the fluoroscope, or he must be able to say that he is skilled in the use of the x-ray machine and in taking and developing x-ray pictures, and that he took the picture offered in evidence with the body in a certain position, describing it, with a machine which he knows to be in good working condition and accurate, and that from his experience he was able to say that the picture produced by the machine was an accurate picture of the internal conditions of the body. These methods of establishing the accuracy of the picture are not exclusive, but whatever method is used, its accuracy must be established before it is admitted."

Therefore, the doctor should be prepared, if called upon, to properly identify the x-ray pictures, and to give the testimony necessary for their admittance in evidence.

Witness Fees

THE QUESTION is sometimes asked as to whether a physician who is handed a witness subpoena, together with $1.10, as witness fee and mileage, is legally required to come into court and testify as an expert, without additional remuneration commensurate with his professional knowledge and experience. The answer is "yes." Along about 1897 our State Supreme Court discussed this subject at some length, with the conclusion that the refusal of a physician, to answer a hypothetical question calling for his opinion, who had been regularly subpoenaed and placed upon the witness stand, for the reason that special compensation had not been paid or assured him, justified the trial court in fining him for contempt. That opinion was given in the case of Dixon vs. The People of the State of Illinois, and appears in volume 168 of the Illinois Supreme Court reports, p. 179. I know of no decision of our Supreme Court changing or modifying the foregoing decision.

However, I think that almost everybody now will agree that the physician called to testify from his expert knowledge should receive more than the customary witness fee provided for a lay witness. The fee to be charged is a matter concerning which the physician should have an understanding with the party calling him before going on the stand.

Nobody wants to call a witness to the witness stand who is reluctant to testify fully and without reservations. It is rarely that we hear any complaint as to a charge made by a doctor for testifying as a witness.

Settlement Contracts

FOR THE BENEFIT particularly of those physicians who reside outside of Chicago, and those who have little personal contact with the Industrial Commission, I will state our practice with reference to cases where the parties have entered into an agreement as to the total amount of compensation to be paid on account of an injury, which agreement they wish to have approved by the Industrial Commission. This kind of agreement is known as a settlement contract, for which we furnish the blanks. This is a very important branch of the work of the Industrial Commission and we pass upon thousands of these cases each year. In cases arising outside of Chicago, these settlement contracts are sent in to the Industrial Commission, and should be accompanied with a copy of the report of some reputable physician or surgeon who has treated or examined the injured workman. Upon a consideration of the terms of the settlement contract, if it appears fair to the injured employee and to agree with the report of the physician or surgeon, if a report of the attending or examining physician or surgeon accompanies the settlement contract, the Commission will promptly approve it upon the facts submitted and it will not be necessary to set the matter down for hearing or to write for further facts and information. In this class of cases, we must rely very largely upon the verity and clearness of the doctor's report. We men who sit as members of the Industrial Commission are not doctors. Our knowledge of anatomy and pathology is not extensive. We, therefore, must rely upon the medical man for this information. Therefore when a physician or surgeon makes a written report which is to accompany a settlement contract for consideration of the Industrial Commission, it should convey a clear and precise picture of the case as seen from his eyes. If the information given by the doctor in his report is vague and indefinite, then it becomes necessary to set the matter down for hearing and go further into the facts. This sometimes results in weeks of delay.

In making a written report, a doctor is not limited by the rules of evidence as on the witness stand. He may give subjective symptoms, but should state that they are subjective. He may give

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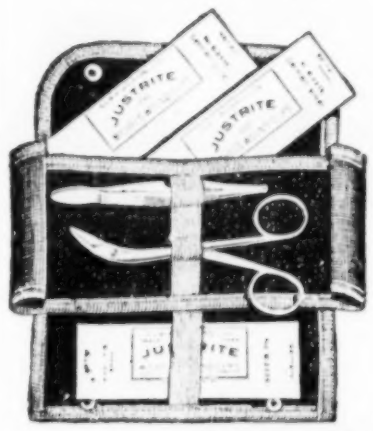

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his conclusions as to percentage of loss of use of a member. He may be permitted to tell about everything from a medical standpoint. But he should not go into the field of legal conclusions. For instance, the other day I saw a doctor's report, which, after a few words to the effect that he found some internal injuries, ended with the statement that the man was 50% disabled. Now, such a report may have been admirable if made for a lodge or benefit association. It meant that, as the result of the injury, the man was half as good as he used to be. But it was almost worthless as far as the Industrial Commission was concerned, because he reached into the domain of legal conclusion. Compensation in such a case is computed upon a percentage of the difference between what the man earned before his injury and what he earns or is able to earn after his injury. All that was desired from the doctor was a complete and detailed statement as to the physical condition of the injured employee and the probable duration of disability.

If you are making a report as to a disfigurement to the head, face or hands, an exact description of the scar should be given, with reference to its location, measurements, color, whether or not it is adherent to underlying structures, and at what distance it could be observed by an ordinary person; but never any opinion as to how much compensation the man is entitled to receive on account of the disfigurement, because that is a legal conclusion.

If it is an eye examination, the report should show the visual acuity as shown by the Snellen Test chart, and not a conclusion as to what that reading represents in percentage of loss of vision.

Problems

ONE of the problems which has given us a great deal of anxiety is that of a workman along in years, who meets with a moderately serious accident which incapacitates him from work for a month or two. He is apt to come to the conclusion that he is not able to return to work of any kind. An examination by the physician discloses that possibly as a direct result of the injury there is a small amount of permanent disability.

But along with it there are also findings of arteriosclerosis, myocarditis, and those other things which are the heritage of old age, but seem to have no possible relation to the injury. The man comes before the Industrial Commission and tells his story. He says that he had been working steadily for many years until he had this injury, and now he is able to work no longer. The Supreme Court has indicated that in cases of this kind the Commission should only allow compensation for that part of the disability which is due to the accident. But by what rule of medicine, law or logic this partition is to be made, the Supreme Court does not say.

I recall two cases of this kind that came up before me upon petition for review. In both cases an arbitrator had found the man completely and permanently disabled and entered an award for compensation for total disability, with a pension for life. I was convinced from the evidence that the men were totally and permanently disabled from work. I did not believe that all of the disability was due to the injuries. In an effort to get some further expression from the Supreme Court, I made up my mind to enter an award which would allow compensation for that proportion of the disability resulting from the injury and not to allow any compensation for that proportion of the disability due to the other causes. But how was this division to be made? In my profession as a lawyer I have been taught to follow precedent; the older the precedent, the more sacred. So for a precedent I fell back upon the wisdom of that ancient ruler, King Solomon, and decreed that the disability must be divided into equal parts, and the compensation awarded was exactly half of that fixed in the award of the arbitrator. Unfortunately, neither side appealed from these decisions and, therefore, the cases never reached the Supreme Court.

Another medical problem with which we have a great deal to do is the relation of arthritis to trauma. This question comes up most often in the coal mining industry. A man may be knocked down under a heavy fall of coal, may be pushing a car with his back against it, or lifting a heavy chunk of coal and claims to have strained himself. The man is given medical attention and afterwards, when he is up and around, complains of pain in his back and inability to stoop. An x-ray discloses an arthritic condition

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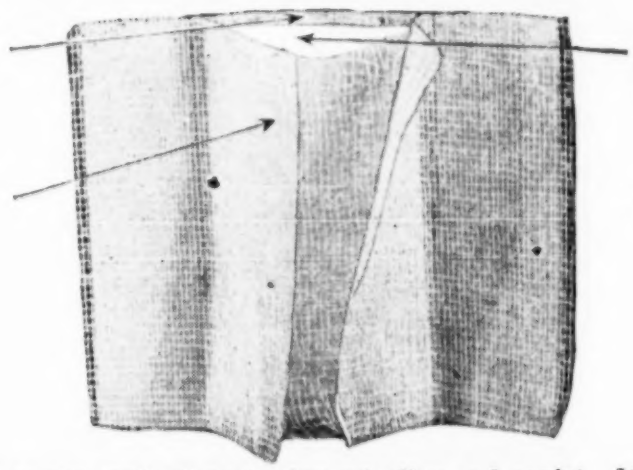

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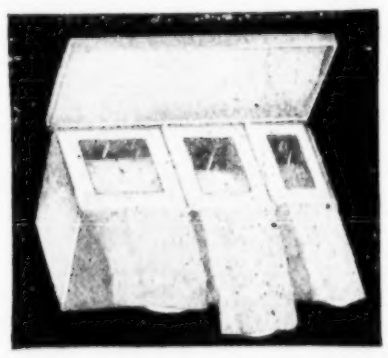

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in the vertebrae. One doctor will inform us that failure of the nutritional process to function normally, due to lowered resistance following the injury, has permitted the arthritic germ or process, or whatever it is, to localize at the point of injury in the back, and, therefore, the arthritis is the result of trauma. Another doctor will say that the arthritis is merely the result of an infective process, saving its origin in some local infection elsewhere in the body, such as the teeth or tonsils, and has no relation to any trauma or injury which the man may have received One doctor tells us that arthritis can develop in a laboring man as the result of hard work over long periods of time and that such an arthritis may be aggravated by trauma and may hasten the progress of the arthritic process. Another doctor says that, even though it were aggravated, the aggravation would be only a temporary affair and would clear up and in the end would not be a factor in accelerating the progress of the disease.

Thus it is that we have statements from one physician which may be in direct conflict with the statements made by another physician. I have in my desk an x-ray of a man's chest. The man afterwards died and claim for compensation was filed. The x-ray was then offered in evidence. About the center of the picture, a few inches below the neck, there appears an object quite pronounced which looks to the layman like the more pointed end of an egg, with the larger half hidden. One set of doctors testified that this was a tumor mass on the esophagus and another set of doctors testified that is was the arch of the aorta.

Conflict of medical opinion on x-rays frequently occurs in head injuries. What one doctor diagnoses as a fracture of the skull, another will claim is a suture. An abnormal curvature of the spine will be classed by one doctor as due to an injury, another as being congenital.

Hernias

ONE OF THE MOST perplexing, as well as one of the most common problems which we have to face, is that of the man with a hernia. I have heard doctors attempt to wipe out the whole subject with one stroke by a statement that all hernias are congenital and therefore not compensable. I think that most modern medical authorities are in accord with the first part of that statement, namely, that all hernias are of congenital origin, except those extremely rare hernias caused by direct physical rupture of the tissues of the abdomen. I do not think the authorities are altogether in accord as to whether the ordinary hernia can be caused by strain or heavy lifting. Some doctors say that the appearance of a hernia following a twist or strain is merely a manifestation of the hernia and not the cause of it; others that the excessive twist or strain is an aggravation of a preexisting condition, congenital or otherwise, and therefore is to be classed as an accidental injury.

The Workmen's Compensation Board of Pennsylvania, after an exhaustive study of the subject, has divided hernias into three classes, the first two of which are compensable and the third noncompensable. The first class is called "traumatic hernias," those which develop immediately or shortly following direct violence of the abdominal wall, resulting in the tearing of the soft tissues at the point where the hernia appears. This class of hernia is compensable. Second, what are called "sudden hernias or hernias of effort," being those which are caused or materially aggravated by the indirect application of force, arising from a particular occupational strain, causing increased intra-abdominal pres-

sure. This class is also compensable. The third, or non-compensable class, are those hernias which are of slow development from natural causes and cannot be related in an appreciable degree to a particular exciting cause.

In California the Industrial Accident Commission has laid down the following rule: "The consensus of medical and surgical opinion runs to the effect that hernia is very rarely, in any proper sense, the result of an accidental injury; that the accident is at best no more than the occasion, instead of the cause of the malady; that the origin of the difficulty is congenital and more in the nature of a disease than an injury; that every claim for compensation based upon an alleged rupture is to be viewed with suspicion."

The Industrial Commission of Nevada has adopted a similar attitude.

This problem in Illinois became so vexing, and so numerous the claims for compensation and operations for hernias alleged to have arisen out of and in the course of employment, that in 1925 the General Assembly attempted to clarify what we might call the inguinal atmosphere by some legislation on the subject. The following provision was placed in the Workmen's Compensation Act:

"An injured employee, to be entitled to compensation for hernia, must prove: first, that hernia was of recent origin; second, its appearance was accompanied by pain; third, that it was immediately preceded by trauma arising out of and in the course of the employment; fourth, that the hernia did not exist prior to the injury." The time for giving notice to the employer of the hernia was reduced to 15 days, instead of the usual 30 days.

This has helped some, although if we were to make a strict and unbending interpretation of this provision, such a thing as a compensable hernia could hardly be possible. It could only apply to a hernia resulting from actual rupture of the tissues at the site of an accident, and I do not recall that I have ever seen such a case.

Because of the difficulty in distinguishing between a compensable hernia, and a non-compensable hernia, some employers years ago adpoted the policy of furnishing an operation in every case where there was any question about it at all The man was paid compensation for the usual six weeks' healing period, and that ended the matter. Some insurance carriers, in a doubtful case, will offer an operation and hospital services, but decline to assume any liability for the payment of compensation.

When an employer sends an employee to a doctor for examination and a hernia is discovered, I do not think it is the duty of the doctor to pass upon the question of whether it is compensable or not compensable. It is the duty of the doctor, however, to make a detailed report of his findings to the employer and leave the legal question up to him for solution. Of course, in case of a strangulated hernia, there is no alternative for the surgeon but to operate immediately, and leave the legal question of liability for determination afterwards.

These are some of the problems that come up almost daily in our work and have given us considerable trouble. We try to decide them fairly. We may not do exact justice, but we try to come as near to it as possible.

The family doctor has a place in the medical field which cannot be filled by any other doctor. Through his close relationship with his patients he knows their histories, their peculiarities and their general physical and mental make-up, and because of this knowledge and his personal relationship, he is in a position to render a peculiarly useful and valuable service. He can successfully handle a great deal of the ordinary work. But a conscientious general practitioner will not hesitate to refer his patients to a specialist in diagnosis, or a specialist in surgery, or any of the other branches of medicine, when to his mind such action is indicated, as in case of an arthritic spine or some abscure back injury, or an eye injury.

I think the industrial surgeon should be none the less solicitious of the welfare of his patients than is the family doctor. The injured workman should be impressed with the idea that the doctor is doing everything that medical science can do to get him well. This inspires confidence. Confidence in turn brings cooperation from the patient, which is a very important factor in the treatment.

The industrial surgeon should also be a specialist in his line of work. To know medicine and its application to the things of industry, without a technical training and large experience, is impossible. The best medical service a community affords is none too good. If medical service in industrial work is to be limited, no first class surgeon would undertake it. I have heard it said that more can be done by a competent surgeon, experienced in the treatment of emergency surgery, in a few hours following an accident, than the most skillful surgeon in the world can accomplish in the week following.

I mentioned in the beginning, that the Workmen's Compensation Act in Illinois gives an injured employee the right to select his own physician or surgeon at his own expense. There are students of workmen's compensation laws, men of high standing and experience, who contend that in every case the injured employee should have this right, and that the employer should bear the expense. In Maryland the employee has this right, and I think in one or two other states. There has been some discussion of this subject among members of Industrial Commissions at their conventions. This discussion was the result of the agitation of the subject in some sections of the United States. The Secretary of the Association of Industrial Accident Boards and Commissions of the United States and Canada assigned that subject to Mr. McShane, a member of the Industrial Commission of the State of Utah, for discussion, at the convention held at Atlanta, Georgia, September, 1932. Mr. McShane prepared and read before the convention a strong and well-written paper in support of the proposition that an injured employee should have the right to have a physician or surgeon of his own selection treat him for his injuries at the employer's expense. The reading of this paper was followed by a general discussion but no action was taken on the matter by the convention. If the law was changed so as to provide that an injured employee might be treated for his injuries by a physician or surgeon of his own selection at the expense of his employer, I fear that an unwise selection might often be made by the injured employee. I can see where in many cases an injured employee with a serious fracture might call a physician who had little experience in dealing with fractures. With an eye injury, he might go to a general practitioner for treatment, until the serious nature of the injury became apparent to the general practitioner who would then have to transfer the injured employee to an eye specialist, whom he should have consulted in the first instance. Considerations other than the skill, ability and experience of the physician or surgeon would, in many cases, control the selection by the injured employee. Another danger would be that the employee who suffers an apparently trivial injury, and who should have competent medical treatment, might proceed to treat himself with salves, flax seed poultices and other home remedies, thus turning what at the outset gave every evidence of a slight disability into a serious one.

It seems to me that a change in the law in the manner above indicated would not meet with your approval. I believe that the industrial surgeons must place the responsibility largely upon their own shoulders if the agitation to change the law succeeds. You may wonder how I come to place this responsibility on the industrial surgeons.

On many occasions injured employees have come to the offices of the Industrial Commission complaining about the physician or surgeon furnished by the employer or insurance carrier. These complaints are not usually related to the propriety or impropriety of the medical treatment furnished or to the result obtained. These complaints are that the doctor has been discourteous to him or to members of his family; that the doctor has been rough and abusive; that the doctor hurt him unnecessarily; that the doctor has neglected him and did not see him often enough; that the doctor has failed to come to see him until called several times; that the doctor has refused to answer uestions or has given evasive answers to questions asked; that the doctor has ridiculed his claim about having pains, aches, etc.; that the doctor has been cold and formal toward him, and seemed to lack interest in him; that the doctor has turned him over to internes or young doctors, who in the opinion of the patient lacked knowledge and experience; that the doctor has ordered him back to work before the patient feels that he is able to return to work, etc. No matter how strong the pressure or from what source it comes, the industrial surgeon should never discharge an injured employee from treatment and order him back to work unless he honestly believes that such an employee is actually able to return to work.

I can readily see how a busy and successful physician or surgeon, although

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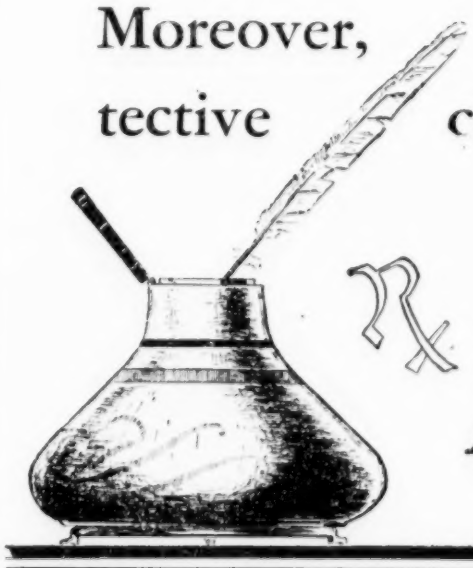

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rendering the most skillful treatment, may sometimes overlook the human element and be somewhat curt or seemingly cold in his attitude toward an injured employee under his treatment.

The ordinary individual will select a doctor as his family physician usually because he knows that the doctor in his relation to the patient has been kind and agreeable. The family physician endeavors to show his sincerity and interest in the patient, and is kindly and considerate in his attention to the patient because he realizes that he must secure the confidence of the patient as an important factor in his successful treatment of the case. The patient does not understand the technic of the treatment. It is the personal relation which impresses him the most.

He does not like to submit to treatment by a physician or surgeon who does not openly show an interest in his welfare.

It is important therefore that the industrial surgeon selected by the employer to treat an injured employee adopt a proper attitude toward his patients. He should do his utmost to secure their confidence and respect. He should be kind and courteous to them and convince them if possible that he is their friend and benefactor. I realize that there are many patients who are very difficult to handle. There are some that no physician can get along with. I have seen several of them during my service on the Industrial Commission. All that I can say is that the industrial surgeon should do the best he can under the peculiar circumstances of each case, to win the friendship, esteem and confidence of the injured employee.

I know some industrial surgeons who are always bubbling over with affability and good humor, their faces are continually wreathed in smiles, and from their lips come words of friendship and good cheer. Their very presence causes a spirit of happiness and good fellowship to affect everyone they come in contact with. I imagine surgeons having these qualities have little trouble winning the confidence and respect of their patients.

Provisions of the Workmen's Compensation Act That the Industrial Surgeon Should Know

IN THIS CONNECTION, I think every physician engaged in industrial work should take time to make himself somewhat familiar with the provisions of the Workmen's Compensation Act and to keep in touch with the amendments, which are usually made every two years. For one reason, the law imposes certain duties upon the surgeon who examines an injured workman at the request of the employer. The law says that when a surgeon makes an examination at the instance of the employer, the employee may have his own physician present. If the employee does not have his own physician present, it is the duty of the surgeon making the examination to furnish, upon request of the injured employee, an exact copy of the report which is made to the employer, such report to be delivered to the employee or his representative, either in person or by registered mail, at least five days prior to the date upon which the case is set for hearing before the Commission. If the surgeon fails or refuses to so deliver a copy of his report when requested, then he is not permitted to testify at the hearing following the examination. Remember, this does not mean that the surgeon may tell the injured man that the report is of a confidential nature and that he should go and see the employer or insurance company about getting a copy of it. The law plainly and specifically makes it the duty of the examining surgeon himself to deliver an exact copy of his report to the injured employee or his representative.

In case a surgeon is called upon, in behalf of the employer, to attend an injured employee who is likely to die, the law provides that it is the duty of the surgeon to call in another surgeon to make an examination, such other surgeon to be selected and paid either by the injured employee or the person or persons who would become his beneficiaries.

The provisions just mentioned are contained in Section 12 of the Workmen's Compensation Act. If the surgeon is requested by the employer to make an examination, and the man refuses to submit himself or unnecessarily obstructs the examination, it should be pointed out to the injured workmen that Section 12 of the Act provides that by so doing his right to compensation may be suspended until he does submit to examination.

Paragraph (d), Section 19, of the Act provides that if any employee shall persist in insanitary or injurious practices which tend to either imperil or retard his recovery, or if he refuses to submit to such medical, surgical or hospital treatment as is reasonably essential to promote his recovery, the Industrial Commission may reduce or suspend the compensation payable to such employee. It is not infrequent for the Industrial Commission to enter an order suspending compensation in such a case. Then, if a patient does not submit to proper treatment, or tears off his dressings, as they sometimes do, or will not follow the instructions of the attending physician, the attention of the patient should be called to the fact that his actions may result in a suspension of his compensation. This may often result in better cooperation on the part of the patient.

In 1925 the legislature adopted an amendment to the Compensation Act, providing that in case of an injury resulting in the amputation of an arm, hand, leg or foot, or the enucleation of an eye, the employer is required to furnish an artificial of such member. I think, in case of such amputation, the attending physician should inform the patient that he is entitled to receive from the employer an artificial limb or eye, as the case may be, and also as to when the healing period has reached the proper stage for the application of the artificial member.

Considerable discussion has arisen as to what is meant by the term "artificial member". In case of a leg, does it mean that the employer shall provide a stump such as that upon which the old-fashioned pirate stalked about the deck, or does it mean the more modern invention, costing several hundred dollars, with mechanical joints, strings and springs to make it stimulate the movements of the natural leg? In case of a hand, does it mean merely an iron hook, or a hand with mechanically controlled fingers, or a combination of both? The opinion of those who have given most thought to this subject seems to be that the artificial member provided should be one that would most nearly take the place of that which had been lost by amputation, and such as adapted to the occupation which the employee expected to follow. Some employers and insurance companies have left the selection of the artificial limb to the injured man. This is a praiseworthy practice, except that the employee is likely to succumb to the arguments of the first artificial limb salesman who happens to reach him.

Doctors sometimes call up or write the Industrial Commission to inquire whether, in connection with medical services, the employer is obliged to replace teeth which have been knocked out as the result of an anccident. By amendment to the Compensation Act, effective July 1, 1927, the employer is now required to furnish an artificial of

any natural teeth which have been lost in an accident. This does not apply to false teeth, however. That would be considered property damage and not bodily injury.

I mention these matters, because I believe it is of importance that the industrial surgeon have knowledge of them, not only for his own benefit, but that in consultations with either the employer or the injured workman, he may have a proper perspective of the whole subject of workmen's compensation. The surgeon should know something about the schedule of weeks provided for the loss or loss of use of the various members, such as fingers, hand, arm, etc. He should know that the loss of the first phalanx of a finger is considered as the loss of one-half of the entire finger; that the loss of more than one phalanx is considered the loss of the entire finger. That where compensation is payable for specific loss of all or part of a member, compensation in addition cannot be collected for disfigurement to that member. That all compensation payments cease with the death of an injured employee, unless death be the result of the injury. The preliminary report of the doctor should always state the number of children under the age of 16 years, if any, as that has an important bearing upon the rate of compensation which the employee will receive.

The members of the Industrial Commission and the arbitrators have a very kindly regard for the doctors with whom they come in contact. For this, two reasons may be given. First, because these doctors are quite generally high class, courteous and educated gentlemen who add dignity to our proceedings. Second, because of the honest and conscientious efforts of the doctors to assist in the determination of the medical disputes pending before the Commission. This last statement cannot be too strongly emphasized, for you may well imagine what a predicament we would be compelled to face and how tremendously difficult our task would be if you gentlemen present here together with the other doctors in this State, were to resolve that the medical profession would have nothing further to do with the Industrial Commission; that the members of your profession would not appear before it or its arbitrators as witnesses and that henceforth you would not make any medical reports regarding injured employee's to it, and that you would wipe it from your calling list or address book. If such a calamity as that were to happen, myself and the members of the Industrial Commission would certainly be very greatly handicapped in the administration of the Workmen's Compensation Law. However, I have absolute confidence in the patriotism, humanity, honesty, skillfulness and devotion to the public welfare of the members of the medical profession and I know that we can continue to rely on your help and assistance in determining the many problems that we are called upon to solve.

I believe that the doctors who are devoting their time to industrial work are putting forth their best efforts in their professional capacity to treat and heal the wounds of the injured and to be honest, conscientious and helpful in their relations with the injured workmen, the employer and the Industrial Commission. It is said that the three great human virtues are faith, hope and charity, and the greatest of these is charity. For the industrial surgeon, may I not add three more great attributes to be desired, namely, skill, confidence and integrity, and I trust I am not going too far when I say that the greatest of these three is integrity.

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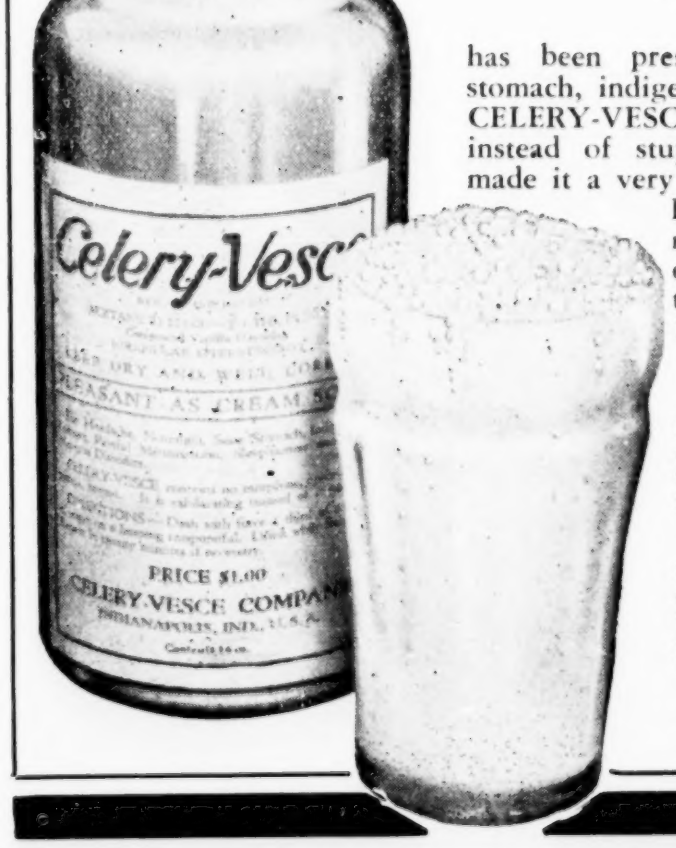

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Industrial Medicine News

22nd Annual Safety Congress

THERE WILL BE a wide variety of subjects covered in the various sessions of the 22nd Annual Safety Congress and Exposition, sponsored by the National Safety Council, during the week of October 2-7, at The Stevens Hotel, Chicago.

On Tuesday afternoon, October 3, the Industrial Nursing Section, under the chairmanship of Miss Grace M. Heidel, will hold a joint session with the Industrial Health Section with the following papers and speakers: "Safety in Nursing" by Dr. W. S. Ash, of the United States Tire Co., Detroit; "Tying up the Nursing Program to Personnel Relations," by Evaline F. Logan, of the Wisconsin Steel Co., Chicago; and "Rehabilitating the Injured Worker," by Dr. J. F. Cox, Medical Director, Illinois Bell Telephone Co., Chicago.

On Wednesday afternoon, October 4, the general subject will be "Dermatitis," under the chairmanship of Dr. C. H. Watson, Medical Director of the American Telephone & Telegraph Co., New York City. Dr. W. J. McConnell, New York City, will speak on "Oil Dermatitis," and Dr. Glenn Adams of Cincinnati, Ohio, will talk on "Other Skin Affections."

"A Practical Medical Program for Industry," will be the subject for the session on Thursday afternoon, under the chairmanship of Dr. W. A. Sawyer, Medical Director of the Eastman Kodak Company. Mr. J. H. Holzbog, Mgr. Industrial Relations of the Chain Belt Co., Milwaukee, will talk on "Health Education." Dr. A. G. Cranch, Medical Director of the National Carbon Co., Cleveland, will speak on "The Placement of Workers from a Physical Standpoint." Dr. Hart E. Fisher, Chief Surgeon, Chicago Rapid Transit Co., will give a demonstration on "Practical First-Aid and Its Relation to Accident Prevention."

Three important papers will be given on the general subject of "The Eye and Its Relation to Safety," in the Friday morning session on October 6, the chairman being Mr. Lewis H. Carris, Managing Director of the National Society for the Prevention of Blindness, New York City. Dr. Frederick Willson, President of Willson Products, Inc., Reading, Pa., will talk on "Principles Underlying the Practice of Eye Protection." "How to Prevent Eye Injuries," will be considered by Mr. G. A. Kuechenmeister, Personnel Manager, Dominion Forge & Stamping Co., Walkerville, Ont., Canada. Mr. A. B. Oday, of the General Electric Co., Nela Park, Cleveland, will consider "Proper Lighting as it Relates to Safety."

Of interest not only to industrial executives and engineers, but also to physicians and nurses will be the program on Friday morning, October 6, relating to "Dust Problem in Industry." Mr. E. O. Jones, Consultant, National Founders Ass'n., Chicago, will speak on "The Mechanical Control of Dust." Dr. E. G. Meiter, Director of the Industrial Hygiene Laboratory of the Employers Mutual Liability Insurance Co., Milwaukee, Wis., will talk on "How to Determine the Dust Content of the Atmosphere in Dusty Industries." This meeting will be under the chairmanship of Mr. J. R. Allan, Ass't. Mgr. Industrial Engineering and Construction Dept., International Harvester Co., Chicago.

An extensive group of exhibits has been planned for the Exposition, featuring many different kinds of protective equipment and procedures. A feature of this exhibit will be daily demonstrations of the various steps in collecting dust samples and making dust counts, by C. O. Sappington, of Chicago, the scheduled hours being 11:30 to 12:30 A.M. and 4:30 to 5:30 P.M.

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